



STIC Search Report

EIC 1700

STIC Database Tracking Number: 128762

To: Lynette T Umez-Eronini
Location:
Art Unit : 1765
August 5, 2004
Case Serial Number: 09/979508

From: John Calve
Location: CP 3/4; 3D62
Phone: 308-4139

John.Calve@uspto.gov

Search Notes

Hi Lynette,

If you have any questions, please feel free to call me at your convenience.

John

703-308-4139.

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Lynette Umez-Fronini Examiner #: 74987 Date: 8/2/04
Art Unit: 1765 Phone Number 30 X 21470 Serial Number:
Mail Box and Bldg/Room Location: Rem. 9A44 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Gas for Plasma Reaction and Method for Production Thereof

Inventors (please provide full names): Hirayama, Tashinobu; Yamada, Toshino;
Sugimoto, Tatsuya; and Sugawara, Mitsuru

Earliest Priority Filing Date: 11/23/2001 / 1999

Pat Sequence Searches Only Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

Search claim 1 36
115 3 3 36
C5F8 (octafluorocyclopentadiene) having
a purity of 99.9, 99.95, and 99.98% by
volume and their total N2 and O2
content not larger than 150ppm by volume,
731

Note: A MSDS prior to 11/23/2001 would be
useful.

trace.

perfluorocyclopentadiene.

STAFF USE ONLY	Type of Search	Vendors and cost where applicable
Searcher: John Calve	NA Sequence (#)	STN
Searcher Phone #:	AA Sequence (#)	Dialog
Searcher Location:	Structure (#)	Questel/Orbit
Date Searcher Picked Up: 8/5/04	Bibliographic	Dr. Link
Date Completed: 8/05/04	Litigation	Lexis/Nexis
Searcher Prep & Review Time: 60	Fulltext	Sequence Systems
Clerical Prep Time:	Patent Family	WWW/Internet
Online Time: 60	Other	Other (specify)

=> file hca

FILE 'HCA' ENTERED AT 15:00:32 ON 05 AUG 2004

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FILE COVERS 1907 - 29 Jul 2004 VOL 141 ISS 6

FILE LAST UPDATED: 29 Jul 2004 (20040729/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d his

(FILE 'HOME' ENTERED AT 14:22:37 ON 05 AUG 2004)

FILE 'REGISTRY' ENTERED AT 14:23:36 ON 05 AUG 2004

E OCTAFLUOROCYCLOPENTENE/CN

L1 1 S E3

FILE 'HCA' ENTERED AT 14:24:26 ON 05 AUG 2004

L2 382 S L1

L3 442 S OCTAFLUOROCYCLOPENTENE# OR PERFLUOROCYCLOPENTENE#

L4 523 S L2 OR L3

L5 1239009 S NITROGEN# OR N2 OR OXYGEN# OR O2

L6 230796 S PPM

L7 366965 S TRACE?

L8 761438 S PLASMA?

L9 49 S L4 AND L8

L10 19 S L9 AND L5

L11 1 S L10 AND L6

L12 0 S L10 AND L7

FILE 'REGISTRY' ENTERED AT 14:27:49 ON 05 AUG 2004

E NITROGEN/CN

E OXYGEN/CN

L13 1 S E3

E NITROGEN/CN

L14 1 S E3

FILE 'HCA' ENTERED AT 14:28:14 ON 05 AUG 2004

L15 565112 S L13 OR L14

L16 QUE L5 OR L15

L17 84 S C5F8

L18 496 S L3 OR L17

E PLASMA/IT

L19 416886 S E3
E ETCH/IT
L20 14607 S E3-E10
L21 1 S L18 AND L5 AND L6
L22 75 S L18 AND L5
L23 1 S L22 AND L6
L24 149318 S (GAS? OR VAPOR? OR VAPOUR?) (2N) (COMPOSIT? OR COMP## OR MIXTUR
L25 11 S L22 AND L24
L26 8 S L25 AND (L19 OR L20)
L27 11 S L25 OR L26
L28 12 S L11 OR L23 OR L21 OR L25 OR L26 OR L27
L29 10 S L28 AND 1907-2001/PY,PRY
L30 2 S L28 NOT L29
L31 368826 S TRACE? OR SCANT?

FILE 'LCA' ENTERED AT 14:35:55 ON 05 AUG 2004

FILE 'WPIX' ENTERED AT 14:41:51 ON 05 AUG 2004

L32 114 S L3 OR C5F8
L33 350793 S L5 OR O2
L34 111241 S L6 OR L7 OR SCANT? OR BEAR?(2N)DETECT? OR (LOW OR MINIMAL# OR
L35 59116 S (GAS? OR VAPOR? OR VAPOUR?) (2N) (COMPOSIT? OR MIXTURE# OR ADMI
L36 131553 S PLASM?
L37 371449 S ETCH? OR DEPOSIT?
L38 14 S L32 AND L35
L39 7 S L38 AND L33
L40 7 S L39 AND (L36 OR L37)
L41 0 S L38 AND L34
L42 7 S L39 OR L40
L43 7 S L38 NOT L42

FILE 'JAPIO' ENTERED AT 14:45:28 ON 05 AUG 2004

L44 35 S L3 OR C5F8
L45 141404 S L5 OR O2
L46 38198 S L6 OR L7 OR SCANT? OR BEAR?(2N)DETECT? OR (LOW OR MINIMAL# OR
L47 14684 S (GAS? OR VAPOR? OR VAPOUR?) (2N) (COMPOSIT? OR MIXTURE# OR ADMI
L48 64722 S PLASM?
L49 220465 S ETCH? OR DEPOSIT?
L50 2 S L44 AND L47
L51 13 S L44 AND (L48 OR L49)
L52 13 S L50 OR L51
L53 7 S L52 AND L45
L54 1 S L52 AND L46
L55 13 S L52 OR L53 OR L54

FILE 'COMPENDEX, INSPEC' ENTERED AT 14:46:59 ON 05 AUG 2004

L56 115 S L3 OR C5F8
L57 507108 S L5 OR O2
L58 192517 S L6 OR L7 OR SCANT? OR BEAR?(2N)DETECT? OR (LOW OR MINIMAL# OR
L59 50473 S (GAS? OR VAPOR? OR VAPOUR?) (2N) (COMPOSIT? OR MIXTURE# OR ADMI
L60 423347 S PLASM?
L61 547805 S ETCH? OR DEPOSIT?
L62 6 S L56 AND L59
L63 5 S L62 AND (L57 OR L58 OR L60 OR L61)

FILE 'LCA' ENTERED AT 14:49:02 ON 05 AUG 2004

FILE 'SCISEARCH, NTIS, SOLIDSTATE' ENTERED AT 14:51:32 ON 05 AUG 2004

L64 142 S L3 OR C5F8
L65 633034 S L5 OR O2
L66 278744 S L6 OR L7 OR SCANT? OR BEAR? (2N) DETECT? OR (LOW OR MINIMAL# OR
L67 31635 S (GAS? OR VAPOR? OR VAPOUR?) (2N) (COMPOSIT? OR MIXTURE# OR ADMI
L68 756165 S PLASM?
L69 400032 S ETCH? OR DEPOSIT?
L70 4 S L64 AND L67
L71 19 S L64 AND (L68 OR L69)
L72 0 S L65 AND L71
L73 411726 S (COMP# OR COMPOSIT? OR DISPERS? OR SUSPENS? OR MIXTURE? OR B
L74 1281667 S (COMP# OR COMPOSIT? OR DISPERS? OR MIXTURE? OR BLEND? OR COM
L75 0 S L71 AND L73
L76 4 S L71 AND L74
L77 6 S L70 OR L76
L78 15 S L71 NOT L77
L79 21 S L77 OR L78

FILE 'COMPENDEX, INSPEC' ENTERED AT 14:55:11 ON 05 AUG 2004

L80 6 S L62 OR L63

FILE 'LCA' ENTERED AT 14:55:21 ON 05 AUG 2004

FILE 'HCA, WPIX, JAPIO, SCISEARCH, NTIS' ENTERED AT 14:56:44 ON 05 AUG 2004

L81 58 DUP REM L29 L30 L42 L43 L55 L79 (2 DUPLICATES REMOVED)

FILE 'MSDS-CCOHS, MSDS-OHS' ENTERED AT 14:58:05 ON 05 AUG 2004
E' OCTAFLUOROCYCLOPENTENE/CN

L82 1 S E3

L83 1 S L82

FILE 'HCA' ENTERED AT 15:00:32 ON 05 AUG 2004

=> d L29 1-10 cbib abs hitind hitrn

L29 ANSWER 1 OF 10 HCA COPYRIGHT 2004 ACS on STN

139:142298 Method of plasma etching an oxide layer using fluorocarbon etchants. Hung, Hoiman; Caulfield, Joseph P.; Shan, Hongqing; Wang, Ruiping; Yin, Gerald Z. (Applied Materials, Inc., USA). U.S. US 6602434 B1 20030805, 20 pp., Cont.-in-part of U.S. 6,174,451. (English). CODEN: USXXAM. APPLICATION: US 1999-440810 19991115. PRIORITY: US 1998-49862 19980327; US 1998-193056 19981116.

AB The invention relates to a method of plasma etching an oxide layer using fluorocarbon etchants. The etching process consists of the steps of (i) flowing into a plasma reaction chamber an etching **gas mixture** consisting of a first amount of a heavy fluorocarbon selected from the group consisting of hexafluorobutadiene, hexafluorocyclobutene, and hexafluorobenzene, a second amount of a chemical inactive gas being at least equal to the first amount, and a third amount of a hydrofluoromethane having no more than two hydrogen atoms; (ii) radio-frequency biasing a pedestal electrode supporting the substrate having an oxide layer overlying a non-oxide layer; and (iii) exciting the etching **gas mixture** into a plasma to thereby etch the oxide layer selectively to the non-oxide layer.

IC ICM H01L021-3065

NCL 216039000; 216067000; 216072000; 216079000; 438714000; 438723000

CC 76-11 (Electric Phenomena)

IT Nitrides

Oxides (inorganic), uses

RL: TEM (Technical or engineered material use); USES (Uses)

(method of **plasma** etching an oxide layer using fluorocarbon **etchants**)

IT Etching

(**plasma**; method of **plasma** etching an oxide layer using fluorocarbon **etchants**)

IT 75-10-5, Difluoromethane 75-46-7, Trifluoromethane 75-73-0,
Tetrafluoromethane 115-25-3, Octafluorocyclobutane 392-56-3,
Hexafluorobenzene 559-40-0, **Octafluorocyclopentene** 661-54-1
685-63-2 697-11-0, Hexafluorocyclobutene 37145-46-3,
Pentafluoropropene

RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(**etchant**; method of **plasma** etching an oxide layer using fluorocarbon **etchants**)

IT 7440-37-1, Argon, processes 7782-44-7, **Oxygen**, processes

RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(etching process gas; method of **plasma** etching an oxide layer using fluorocarbon **etchants**)

IT 7631-86-9, Silica, uses 12033-89-5, Silicon nitride, uses

RL: TEM (Technical or engineered material use); USES (Uses)

(method of **plasma** etching an oxide layer using fluorocarbon **etchants**)

L29 ANSWER 2 OF 10 HCA COPYRIGHT 2004 ACS on STN

138:312918 Etching method of forming holes with a high aspect ratio in a silicon oxide film. Jiwari, Nobuhiro (Japan). U.S. Pat. Appl. Publ. US 2003077909 A1 20030424, 17 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-277725 20021023. PRIORITY: JP 2001-325813 20011024.

AB The invention relates to an etching method of forming holes with a high aspect ratio in a silicon oxide film formed on a substrate via a silicon nitride film. The etching is performed using an etching gas composed of a **mixture** of Ar gas, O2 gas, **C5F8** gas, and CH2F2 gas.

IC ICM H01L021-302

ICS H01L021-461

NCL 438710000

CC 76-14 (Electric Phenomena)

Section cross-reference(s): 57

IT 75-10-5, Difluoromethane 559-40-0, **Octafluorocyclopentene**

7440-37-1, Argon, processes 7782-44-7, **Oxygen**, processes

RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(**etchant**; etching method of forming holes with a high aspect ratio in a silicon oxide film)

L29 ANSWER 3 OF 10 HCA COPYRIGHT 2004 ACS on STN

138:10439 Etching process for fabrication of semiconductor device. Sun, Gow-wei (United Microelectronics Corp., Taiwan). U.S. Pat. Appl. Publ. US 2002182864 A1 20021205, 5 pp. (English). CODEN: USXXCO. APPLICATION: US 2001-888846 20010625. PRIORITY: TW 2001-90113305 20010601.

AB An etching process which improves the resistance of the etch-stop layer to reduce the leakage current in the semiconductor device. The etching process comprises the steps of providing a substrate having an isolation region and a 1st conductive region and a 2nd conductive region formed thereon. The 2nd conductive region is higher than the 1st conductive

region. An etching stop layer is formed over the substrate. A dielec. layer is formed on the etching stop layer. An etching process was performed with a **mixture gas** including CH₂F₂, **C5F8**, CO, O₂ and Ar to form a 1st opening and a 2nd opening in the dielec. layer, wherein the 1st opening exposes a portion of the 1st conductive region and a portion of the isolation region and the 2nd opening exposes a portion of the etching stop layer over the 2nd conductive region.

IC ICM H01L021-302

ICS H01L021-461

NCL 438689000

CC 76-3 (Electric Phenomena)

IT 409-21-2, Silicon monocarbide, uses 11105-01-4, Silicon nitride oxide 12033-89-5, Silicon nitride, uses

RL: NUU (Other use, unclassified); USES (Uses)

(etch stop; etching process for fabrication of semiconductor device using)

IT 75-10-5, Difluoromethane 559-40-0, **Octafluorocyclopentene**

630-08-0, Carbon monoxide, processes 7440-37-1, Argon, processes

7782-44-7, **Oxygen**, processes

RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)

(etching process for fabrication of semiconductor device using)

L29 ANSWER 4 OF 10 HCA COPYRIGHT 2004 ACS on STN

137:319099 Semiconductor device and method of fabricating the same with contact holes. Ueda, Yasuhiko (NEC Corporation; Hitachi Ltd., Japan). U.S. Pat. Appl. Publ. US 2002155699 A1 20021024, 19 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-124389 20020418. PRIORITY: JP 2001-124260 20010423.

AB A method for simply forming a miniature contact hole in a self-aligned manner with a wiring layer. A gate insulating film, a gate electrode, and a protective insulating layer are formed on the surface of a Si substrate, and a blanket insulating film is deposited over the entire surface to cover a source/drain diffusion layer. Subsequently, an interlayer insulating film is laminated on the blanket insulating film. N is added to a **mixture gas** of **C5F8** and O₂, and the resulting **mixture gas** is excited by a plasma for use as an etching gas. The interlayer insulating film is etched by reactive ion etching (RIE) using the blanket insulating film as an etching stopper to form a contact hole. A Si nitride film is preferably used for the protective insulating layer. A Si nitride film or a Si carbide film is preferably used for the blanket insulating film.

IC ICM H01L021-4763

NCL 438637000

CC 76-3 (Electric Phenomena)

IT Hydrocarbons, uses

RL: NUU (Other use, unclassified); USES (Uses)

(fluoro, dry **etchant**; semiconductor device and method of fabricating same with miniature contact holes using)

IT 75-10-5, Difluoromethane 75-46-7, Fluoroform 75-73-0, Carbon fluoride (CF₄) 115-25-3, Perfluorocyclobutane 559-40-0,

Perfluorocyclopentene 593-53-3, Methyl fluoride 7664-41-7,

Ammonia, processes 10024-97-2, Nitrous oxide, processes

RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)

(dry **etchant**; semiconductor device and method of fabricating same with miniature contact holes using)

- IT 7727-37-9, **Nitrogen**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(dry **etchant**; semiconductor device and method of fabricating same with miniature contact holes using)
- L29 ANSWER 5 OF 10 HCA COPYRIGHT 2004 ACS on STN
137:162311 Oxide dielectric plasma etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication. Ding, Ji; Kojiri, Hidehiro; Ishikawa, Yoshio; Horioka, Keiji; Wang, Ruiping; Wu, Robert W.; Hung, Holman (Applied Materials, Inc., USA). U.S. US 6432318 B1 20020813, 8 pp. (English). CODEN: USXXAM. APPLICATION: US 2000-506112 20000217.
- AB A systematic oxide plasma etching recipe includes a heavy perfluorocarbon having F/C ratios <2 such as C4F6 or **C5F8**, an O-containing gas such as **O2**, CO or CO2, a lighter fluorocarbon or hydrofluorocarbon, and a noble diluent gas such as Ar or Xe. The amts. of the 1st three gases are chosen such that the ratio (F-H)/(C-O) is at least 1.5 and ≤2. Alternatively, the **gas mixture** may include the heavy fluorocarbon, C tetrafluoride, and the diluent with the ratio of the 1st two chosen such the ratio F/C is 1.5-2.
- IC ICM H01L021-3065
NCL 216067000
CC 76-3 (Electric Phenomena)
IT Noble gases, uses
RL: NUU (Other use, unclassified); USES (Uses)
(diluent gas; oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT Hydrocarbons, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluoro; oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT **Mixtures**
(**gaseous**; oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT Dielectric films
(oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT Perfluorocarbons
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT Oxides (inorganic), processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT Etching
(**plasma**; oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT 7440-37-1, Argon, uses
RL: NUU (Other use, unclassified); USES (Uses)

- (carrier gas; oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT 75-10-5, Difluoromethane 75-46-7, Trifluoromethane 75-73-0, Carbon tetrafluoride 76-16-4, Perfluoroethane 115-25-3, Octafluorocyclobutane 630-08-0, Carbon monoxide, processes 685-63-2 7782-44-7, **Oxygen**, processes 7782-44-7D, **Oxygen**, compds.
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- IT 7440-21-3, Silicon, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(poly, etching with oxide as mask; oxide dielec. **plasma** etching process reducing striations and maintaining critical dimensions in integrated circuit fabrication)
- L29 ANSWER 6 OF 10 HCA COPYRIGHT 2004 ACS on STN
135:379644 Gas analysis method and apparatus for semiconductor device fabrication. Nakabou, Yasushi (Handotai Sentan Technologies K. K., Japan). Jpn. Kokai Tokkyo Koho JP 2001324425 A2 **20011122**, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-140476 20000512.
- AB The method contains (A) contacting exhaust gases generated in semiconductor device fabrication with treatment agents which are reactive with reactive gases but not reactive with perfluoro **compound gases** (PFC) and (B) analyzing PFC concns. in the exhaust gases. The treatment agents may be Ca(OH)₂, NaOH, and/or KOH and PFC may be CF₄, CHF₃, NF₃, C₂F₄, C₃F₈, c-C₄F₈, SF₆, and/or c-**C5F8**. The method may contain contacting the treatment agents with dry N before use.
- IC ICM G01N001-22
ICS G01N001-22; G01N031-00
- CC 76-3 (Electric Phenomena)
Section cross-reference(s): 59, 79
- ST exhaust gas analysis semiconductor device fabrication; PFC perfluoro **compd gas** analysis app; reactive halogen gas removal calcium hydroxide
- IT 75-46-7, Trifluoromethane 75-73-0 76-16-4, Hexafluoroethane 76-19-7, Octafluoropropane 115-25-3, Octafluorocyclobutane 116-14-3, Tetrafluoroethylene, processes 2551-62-4, Sulfur hexafluoride 7783-54-2, **Nitrogen** trifluoride 139064-01-0, Octafluorocyclopentane
RL: ANT (Analyte); PEP (Physical, engineering or chemical process); ANST (Analytical study); PROC (Process)
(anal. of exhaust gases after removal of reactive gases for semiconductor device fabrication)
- L29 ANSWER 7 OF 10 HCA COPYRIGHT 2004 ACS on STN
134:75572 Removal of halogen-containing compound gases from waste gases. Ueda, Akio; Matsuoka, Nobuhiko; Ichimaru, Hiroshi; Nakano, Hisaji; Tainaka, Masahiro (Central Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2000354734 A2 **20001226**, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-167055 19990614.
- AB The gases are removed by the following steps: (1) treating the waste gases with a solid agent of Si, B, W, Mo, V, or Ge containing catalysts and with oxide gases, e.g., O₂, O₃, N₂O, to form halide gases and (2) treating the halide gases. The catalysts may be Fe, Ni, Al, their oxides,

and/or their fluorides. The solid agent may be heated at 100-1000°. The halogen-containing **compound gases**, e.g., **C5F8**, having low reactivity at normal temperature, are converted to halides, e.g., SiF₄, in the former step and then removed by the latter step by conventional method, e.g., alkali treatment, wet-scrubber treatment.

- IC ICM B01D053-70
ICS B01D053-34; B01D053-86; B01J021-12; B01J023-745; B01J023-755;
B01J027-125
- CC 59-4 (Air Pollution and Industrial Hygiene)
- ST halogen **compd gas** removal waste gas; halide gas
formation catalyst waste gas treatment
- IT Catalysts
Waste gases
(removal of halogen **compound gases** from waste gases
by forming halide gases with catalyst-containing solid agents)
- IT Halides
RL: PNU (Preparation, unclassified); REM (Removal or disposal); PREP
(Preparation); PROC (Process)
(removal of halogen **compound gases** from waste gases
by forming halide gases with catalyst-containing solid agents)
- IT Halogen compounds
RL: POL (Pollutant); RCT (Reactant); REM (Removal or disposal); OCCU
(Occurrence); PROC (Process); RACT (Reactant or reagent)
(removal of halogen **compound gases** from waste gases
by forming halide gases with catalyst-containing solid agents)
- IT 7782-44-7, **Oxygen**, reactions 10024-97-2, **Nitrogen**
oxide (N₂O), reactions 10028-15-6, Ozone, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(halogen compound reacted with; removal of halogen **compound**
gases from waste gases by forming halide gases with
catalyst-containing solid agents)
- IT 1309-37-1, Iron oxide (Fe₂O₃), uses 1344-28-1, Alumina, uses
7429-90-5, Aluminum, uses 7439-89-6, Iron, uses 7440-02-0, Nickel,
uses 7784-18-1, Aluminum fluoride (AlF₃) 10028-18-9, Nickel fluoride
RL: CAT (Catalyst use); USES (Uses)
(removal of halogen **compound gases** from waste gases
by forming halide gases with catalyst-containing solid agents)
- IT 56-23-5, Tetrachloromethane, reactions 67-66-3, Trichloromethane,
reactions 74-83-9, Monobromomethane, reactions 74-87-3,
Monochloromethane, reactions 74-95-3, Dibromomethane 74-97-5,
Bromochloromethane 75-01-4, Monochloroethylene, reactions 75-10-5,
Difluoromethane 75-45-6, Monochlorodifluoromethane 75-46-7,
Trifluoromethane 75-61-6, Dibromodifluoromethane 75-63-8,
Bromotrifluoromethane 75-69-4, Trichlorofluoromethane 75-71-8,
Dichlorodifluoromethane 75-72-9, Chlorotrifluoromethane 75-73-0
76-15-3 76-16-4, Hexafluoroethane 76-19-7, Octafluoropropane
353-54-8, Tribromofluoromethane 353-59-3, Bromochlorodifluoromethane
354-55-2, Bromopentafluoroethane 1320-37-2, Dichlorotetrafluoroethane
1511-62-2, Bromodifluoromethane 1868-53-7, Dibromofluoromethane
2551-62-4, Sulfur hexafluoride 25497-30-7, Dibromotetrafluoroethane
26523-64-8, Trichlorotrifluoroethane 29256-79-9,
Dibromochlorotrifluoroethane
RL: POL (Pollutant); RCT (Reactant); REM (Removal or disposal); OCCU
(Occurrence); PROC (Process); RACT (Reactant or reagent)
(removal of halogen **compound gases** from waste gases
by forming halide gases with catalyst-containing solid agents)
- IT 7439-98-7, Molybdenum, reactions 7440-21-3, Silicon, reactions

7440-33-7, Tungsten, reactions 7440-42-8, Boron, reactions 7440-56-4, Germanium, reactions 7440-62-2, Vanadium, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(solid agent; removal of halogen **compound gases** from waste gases by forming halide gases with catalyst-containing solid agents)

L29 ANSWER 8 OF 10 HCA COPYRIGHT 2004 ACS on STN

134:24565 **Plasma** reactive gas and manufacturing gases thereof.

Hirayama, Toshitatsu; Yamada, Toshiro; Sugimoto, Tatsuya; Sugawara, Mitsuru (Nippon Zeon Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2000332001 A2 **20001130**, 11 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1999-143562 19990524.

Applicant

AB The title **plasma** reactive gas for dry etching, CVD, or ashing are **octafluorocyclopentene**. The purity of the gas is 99.9 volume% with N2/O2 impurities ≤ 200 vol .ppm and with moisture content at ≤ 20 wt .ppm. The gas is environmentally acceptable.

IC ICM H01L021-3065

ICS H01L021-205

CC 76-11 (Electric Phenomena)

ST **octafluorocyclopentene plasma** reactive gas etching CVD ashing

IT Water vapor

(content, low; **plasma** reactive gas and manufacturing gases thereof)

IT Etching

(dry, **plasma**; **plasma** reactive gas and manufacturing gases thereof)

IT Ashing

Vapor deposition process

(**plasma**; **plasma** reactive gas and manufacturing gases thereof)

IT **Plasma**

(reactive gas; **plasma** reactive gas and manufacturing gases thereof)

IT 7727-37-9, **Nitrogen**, processes 7782-44-7, **Oxygen**, processes

RL: REM (Removal or disposal); PROC (Process)

(impurity; **plasma** reactive gas and manufacturing gases thereof)

IT **559-40-0, Octafluorocyclopentene**

RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); TEM (Technical or engineered material use); PROC (Process); RACT (Reactant or reagent); USES (Uses)

(**plasma** reactive gas; **plasma** reactive gas and manufacturing gases thereof)

IT **559-40-0, Octafluorocyclopentene**

RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); TEM (Technical or engineered material use); PROC (Process); RACT (Reactant or reagent); USES (Uses)

(**plasma** reactive gas; **plasma** reactive gas and manufacturing gases thereof)

L29 ANSWER 9 OF 10 HCA COPYRIGHT 2004 ACS on STN

128:289117 **Gas composition** for dry etching and process of

dry etching. Sekiya, Akira; Yamada, Toshiro; Goto, Kuniaki; Takagaki, Tetsuya (Japan as Represented by Director General of the Agency of Industrial Science, Japan; Mechanical Social Systems Foundation; Electronic Industries Association of Japan; Nippon Zeon Co., Ltd.; Sekiya, Akira; Yamada, Toshiro; Goto, Kuniaki; Takagaki, Tetsuya). PCT Int. Appl. WO 9819331 A1 **19980507**, 16 pp. DESIGNATED STATES: W: KR, US;

RW: AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE.
(Japanese). CODEN: PIXXD2. APPLICATION: WO 1997-JP3966 19971030.
PRIORITY: JP 1996-305819 19961030.

- AB A **gas composition** for dry etching is described, which comprises a perfluorocycloolefin and 1-40 mol % (based on the perfluorocycloolefin) of **O2** and/or O-containing compound; the perfluorocycloolefin being preferably the one having 3-8 C atoms, still more preferably 4-6 C atoms. Addnl., the composition may contain a saturated hydro-fluorocarbon. The composition is useful for preferential etching of SiO2.
- IC ICM H01L021-302
- CC 76-3 (Electric Phenomena)
- IT Hydrocarbons, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(fluoro; **gas composition** for dry etching)
- IT Cycloalkenes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(perfluoro; **gas composition** for dry etching)
- IT Etching
(plasma; **gas composition** for)
- IT 355-75-9, Perfluorocyclohexene 559-40-0, **Perfluorocyclopentene**
697-11-0, Perfluorocyclobutene 7782-44-7, **Oxygen**, processes
11104-93-1, **Nitrogen** oxide, processes 12624-32-7, Sulfur oxide
12795-06-1, Carbon oxide
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**gas composition** for dry etching)
- IT 7631-86-9, Silica, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**gas composition** for dry etching of)
- L29 ANSWER 10 OF 10 HCA COPYRIGHT 2004 ACS on STN
- 89:172333 Dielectric strengths of new **gases** and **gas mixtures**. James, D. R.; Christophorou, L. G.; Pai, R. Y.; Pace, M. O.; Mathis, R. A.; Sauers, I.; Chan, C. C. (Oak Ridge Natl. Lab., Oak Ridge, TN, USA). Report, CONF-780301-1, 28 pp. Avail. NTIS From: Energy Res. Abstr. 1978, 3(15), Abstr. No. 34953 (English) 1978.
- AB The most effective gaseous dielects. are **gas mixts.** with components chosen on the basis of fundamental physicochem. knowledge, especially on low-energy electron-mol. interactions. On the basis of such knowledge, especially on electron attachment and electron slowing down, a number of new **gases** and **gas mixts.** are described. with breakdown strengths superior to pure SF6. These include the unitary gases c-C4F8 (perfluorocyclobutane), C4F8 (perfluorobutene-2), C4F6 (perfluoro-2-butyne), C6F10 (perfluorocyclohexane), **C5F8** (**perfluorocyclopentene**), and C6F12 (perfluorodimethylcyclobutane), and the multicomponent **gas mixts.** 20% C4F6 + 80% SF6, 40% C4F6 + 60% **N2**, 50% C4F6 + 50% SF6, and 30% C4F6 + 20% SF6 + 50% **N2** with breakdown strengths (relative to SF6 of 1); 1.4, 1.8, 2.2, 2.1, 2.2, 2.4, 1.3, 1.4, 1.75, and 1.33, resp. The initial decomposition products of some of the new insulators caused by electron impact are presented and their implications assessed.
- CC 76-3 (Electric Phenomena)
- ST dielec strength gas; perfluorocyclobutane dielec strength; perfluorobutene

dielec strength; perfluorobutylene dielec strength; perfluorocyclohexane dielec strength; **perfluorocyclopentene** dielec strength; perfluorodimethylcyclobutane dielec strength; sulfur fluoride mixt dielec strength; electron impact decompn perfluorocarbon

IT Dielectric strength
(of **gases** and **gaseous mixts.**)

=> d L29 1-2 cbib abs hitind hitrn

L29 ANSWER 1 OF 10 HCA COPYRIGHT 2004 ACS on STN

139:142298 Method of plasma etching an oxide layer using fluorocarbon etchants. Hung, Hoiman; Caulfield, Joseph P.; Shan, Hongqing; Wang, Ruiping; Yin, Gerald Z. (Applied Materials, Inc., USA). U.S. US 6602434 B1 20030805, 20 pp., Cont.-in-part of U.S. 6,174,451. (English). CODEN: USXXAM. APPLICATION: US 1999-440810 19991115. PRIORITY: US 1998-49862 19980327; US 1998-193056 19981116.

AB The invention relates to a method of plasma etching an oxide layer using fluorocarbon etchants. The etching process consists of the steps of (i) flowing into a plasma reaction chamber an etching **gas mixture** consisting of a first amount of a heavy fluorocarbon selected from the group consisting of hexafluorobutadiene, hexafluorocyclobutene, and hexafluorobenzene, a second amount of a chemical inactive gas being at least equal to the first amount, and a third amount of a hydrofluoromethane having no more than two hydrogen atoms; (ii) radio-frequency biasing a pedestal electrode supporting the substrate having an oxide layer overlying a non-oxide layer; and (iii) exciting the etching **gas mixture** into a plasma to thereby etch the oxide layer selectively to the non-oxide layer.

IC ICM H01L021-3065

NCL 216039000; 216067000; 216072000; 216079000; 438714000; 438723000

CC 76-11 (Electric Phenomena)

IT Nitrides

Oxides (inorganic), uses

RL: TEM (Technical or engineered material use); USES (Uses)
(method of **plasma** etching an oxide layer using fluorocarbon etchants)

IT Etching

(**plasma**; method of **plasma** etching an oxide layer using fluorocarbon etchants)

IT 75-10-5, Difluoromethane 75-46-7, Trifluoromethane 75-73-0,
Tetrafluoromethane 115-25-3, Octafluorocyclobutane 392-56-3,
Hexafluorobenzene 559-40-0, **Octafluorocyclopentene** 661-54-1
685-63-2 697-11-0, Hexafluorocyclobutene 37145-46-3,
Pentafluoropropene

RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**etchant**; method of **plasma** etching an oxide layer using fluorocarbon etchants)

IT 7440-37-1, Argon, processes 7782-44-7, **Oxygen**, processes

RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(etching process gas; method of **plasma** etching an oxide layer using fluorocarbon etchants)

IT 7631-86-9, Silica, uses 12033-89-5, Silicon nitride, uses

RL: TEM (Technical or engineered material use); USES (Uses)
(method of **plasma** etching an oxide layer using fluorocarbon etchants)

L29 ANSWER 2 OF 10 HCA COPYRIGHT 2004 ACS on STN
138:312918 Etching method of forming holes with a high aspect ratio in a silicon oxide film. Jiwari, Nobuhiro (Japan). U.S. Pat. Appl. Publ. US 2003077909 A1 20030424, 17 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-277725 20021023. PRIORITY: JP 2001-325813 20011024.
AB The invention relates to an etching method of forming holes with a high aspect ratio in a silicon oxide film formed on a substrate via a silicon nitride film. The etching is performed using an etching gas composed of a **mixture** of Ar **gas**, O2 gas, **C5F8** gas, and CH2F2 gas.
IC ICM H01L021-302
ICS H01L021-461
NCL 438710000
CC 76-14 (Electric Phenomena)
Section cross-reference(s): 57
IT 75-10-5, Difluoromethane 559-40-0, **Octafluorocyclopentene** 7440-37-1, Argon, processes 7782-44-7, **Oxygen**, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**etchant**; etching method of forming holes with a high aspect ratio in a silicon oxide film)

=> d L43 1-7 all

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NUMBERS. SEE ALSO:
<http://www.stn-international.de/archive/stnews/news0104.pdf> <<<

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=> d L43 1-7 all

L43 ANSWER 1 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2004-327707 [30] WPIX
DNN N2004-261416 DNC C2004-124216
TI Dual damascene process comprises selectively removing bottom protecting
layer, and removing first etch stopping layer exposed by first recessed
region.
DC L03 U11
IN HA, S R; KIM, I G; LEE, G U; PARK, W J; HAH, S; KIM, I; LEE, K; PARK, W
PA (SMSU) SAMSUNG ELECTRONICS CO LTD; (SMSU) SAMSUNG ELECTRONICS CO INC
CYC 3
PI US 2004058538 A1 20040325 (200430)* 10 H01L021-302
JP 2004111950 A 20040408 (200430) 11 H01L021-768
KR 2004025287 A 20040324 (200445) H01L021-28
ADT US 2004058538 A1 US 2003-654770 20030904; JP 2004111950 A JP 2003-303596
20030827; KR 2004025287 A KR 2002-57192 20020919
PRAI KR 2002-57192 20020919
IC ICM H01L021-28; H01L021-302; H01L021-768
ICS H01L021-3205; H01L021-461
AB US2004058538 A UPAB: 20040511
NOVELTY - A dual damascene process comprises sequentially:
(i) forming a first etch stopping layer (150), a bottom intermetal
dielectric layer (170), a second etch stopping layer (190), and an upper
intermetal dielectric layer (210) on a substrate (100) having a bottom
interconnection (130);
(ii) selectively removing the bottom protecting layer; and
(iii) removing the first etch stopping layer exposed by the first
recessed region.
DETAILED DESCRIPTION - A dual damascene process comprises
sequentially:
(a) forming a first etch stopping layer, a bottom intermetal
dielectric layer, a second etch stopping layer, and an upper intermetal
dielectric layer on an entire surface of a semiconductor substrate having
a bottom interconnection;
(b) successively patterning the upper intermetal dielectric layer,
the second etch stopping layer, and the bottom intermetal dielectric layer
by using a first etch recipe to form a first recessed region exposing a
predetermined region of the first etch stopping layer;
(c) forming a bottom-protecting layer having a planarized surface on
the upper intermetal dielectric layer and in the first recessed region;
(d) successively patterning the bottom protecting layer and the upper
intermetal dielectric layer by using a second etch recipe to form a second
recessed region being overlapped with the first recessed region and having
a wider width than the first recessed region;
(e) selectively removing the bottom protecting layer to expose the
predetermined region of the first etch stopping layer; and
(f) removing the first etch stopping layer exposed by the first
recessed region to expose the bottom interconnection, where the second
etch recipe uses an etch gas that makes an etch selectivity of the upper
intermetal dielectric layer with respect to the bottom protecting layer to
be 0.5-1.5.

USE - The method is used as a dual damascene process.

ADVANTAGE - The method protects the bottom interconnection without forming an oxide fence.

DESCRIPTION OF DRAWING(S) - The figure shows a cross-sectional view of the method.

Substrate 100

Bottom interconnection 130

First etch stopping layer 150

Bottom intermetal dielectric layer 170

Second etch stopping layer 190

Upper intermetal dielectric layer 210

Dwg.3A/3

FS CPI EPI

FA AB; GI

MC CPI: L04-C06; L04-C07; L04-C07B; L04-C12; L04-C27

EPI: U11-C05B9A; U11-C05D3

L43 ANSWER 2 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-067049 [06] WPIX

CR 2003-606915 [57]

DNN N2003-052031 DNC C2003-017383

TI Patterned tantalum gate layer etching during semiconductor manufacture, involves exposing tantalum layer to plasma generated from source **gas** comprising **combination** of inorganic and organic fluorine gases.

DC E16 L03 U11

IN NALLAN, P

PA (MATE-N) APPLIED MATERIALS INC

CYC 1

PI US 2002132488 A1 20020919 (200306)* 9 H01L021-302

ADT US 2002132488 A1 US 2001-759725 20010112

PRAI US 2001-759725 20010112

IC ICM H01L021-302

ICS H01L021-461

AB US2002132488 A UPAB: 20030906

NOVELTY - A tantalum gate layer (206) is exposed to a plasma generated from a plasma source **gas** comprising a **combination** of inorganic and organic fluorine gases. The inorganic and organic fluorine gases are present in the source gas at a volumetric ratio within the range of about 5:1 to 1:5.

USE - For etching a patterned tantalum gate layer formed on a silicon substrate during semiconductor manufacture.

ADVANTAGE - The process allows good control over the tantalum etch rate and improves the etch profile.

DESCRIPTION OF DRAWING(S) - The figure shows a semiconductor structure for etching a patterned tantalum layer.

Tantalum gate layer 206

Dwg.2A/2

FS CPI EPI

FA AB; GI; DCN

MC CPI: E10-H04A3; E31-B03A; L04-C07D

EPI: U11-A10; U11-A12; U11-C07A1

L43 ANSWER 3 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-333379 [37] WPIX

DNN N2002-261944 DNC C2002-096293

TI Plasma-etching method involves changing etching velocity of silicon group insulating film, based on amount of **mixture** of water **vapor** and fluorine gas.

DC L03 U11
PA (SHIH) SEIKO EPSON CORP
CYC 1
PI JP 2001358117 A 20011226 (200237)* 6 H01L021-3065
ADT JP 2001358117 A JP 2000-179907 20000615
PRAI JP 2000-179907 20000615
IC ICM H01L021-3065
AB JP2001358117 A UPAB: 20020613
NOVELTY - Plasma is generated due to mixing of fluorine group gas consisting of C4F8, C3F6, **C5F8** or C4F6, and the water vapor. A silicon group insulating film (38) is etched with the generated plasma at an etching velocity which is changed based on amount of mixture of fluorine group gas and water vapor.
USE - For etching silicon group insulating film formed on semiconductor wafer using plasma, to manufacture semiconductor device.
ADVANTAGE - Performs selective etching on surface of semiconductor wafer, without using high fluorine group gases. The amount of fluorine group gas used is reduced.
DESCRIPTION OF DRAWING(S) - The figure shows a sectional view of the semiconductor wafer.
Silicon group insulating film 38
Dwg.2/3
FS CPI EPI
FA AB; GI
MC CPI: L04-C07D
EPI: U11-C07A1

L43 ANSWER 4 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-328125 [36] WPIX
CR 2003-895694 [82]
DNN N2002-257394 DNC C2002-094745
TI Anisotropical etching method of substrate assembly such as silicon wafers, involves increasing thickness of resist layer during etching of resist-uncovered portions of substrate assembly.

DC L03 P78 U11 V05
IN DONOHOE, K G; STOCKS, R
PA (MICR-N) MICRON TECHNOLOGY INC
CYC 1
PI US 2002000422 A1 20020103 (200236)* 12 C23F001-00
ADT US 2002000422 A1 Div ex US 1999-342677 19990629, US 2001-916734 20010726
PRAI US 1999-342677 19990629; US 2001-916734 20010726
IC ICM C23F001-00
ICS B44C001-22; C23F003-00
AB US2002000422 A UPAB: 20031223
NOVELTY - A resist layer having thickness of less than 600 nm is formed on the surface of a substrate assembly (217). The resist layer is then patterned by removing portions of resist layer. The resist layer and surface of substrate assembly are exposed to a plasma etch, and resist uncovered surface of substrate is simultaneously etched to increasing thickness of resist layer.
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:
(a) Etched substrate assembly;
(b) Manufacturing method of etched substrate assembly
USE - For anisotropically etching silicon wafers and other substrate assemblies, used in integrated circuits.
ADVANTAGE - A high aspect ratio features can be etched. The thickness of resist layer increases, remains constant or decreases much more slowly

than in a conventional etching process.

DESCRIPTION OF DRAWING(S) - The figure shows the sectional view of plasma etcher used for etching substrate assembly.

Substrate assembly 217

Dwg.2/4

FS CPI EPI GMPI

FA AB; GI

MC CPI: L04-C06B1; L04-C07D

EPI: U11-A10; U11-C07A1; U11-C07C1; U11-C07D1; V05-F04E; V05-F05C;
V05-F05E5; V05-F08E1

L43 ANSWER 5 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-279283 [32] WPIX

DNN N2002-217972 DNC C2002-082139

TI Etching of insulating oxide layer of semiconductor device involves etching of insulating layer using a fluorocarbon gas followed by etching using hydrogen containing fluorocarbon gas.

DC L03 P78 U11

IN KO, K

PA (MICR-N) MICRON TECHNOLOGY INC

CYC 1

PI US 6337285 B1 20020108 (200232)* 10 H01L021-302

ADT US 6337285 B1 US 2000-532088 20000321

PRAI US 2000-532088 20000321

IC ICM H01L021-302

ICS B44C001-22; C03C015-00

AB US 6337285 B UPAB: 20020521

NOVELTY - An insulating oxide layer (24) is masked to form etching area on top. The insulating layer is initially etched using fluorocarbon, before reaching the level of field oxide region, to form partially completed opening in insulating layer. Subsequently, insulating layer is etched again using hydrogen containing fluorocarbon along with component(s) of etching process (I) to form opening (40).

DETAILED DESCRIPTION - The method for etching an opening in an insulating oxide layer of semiconductor device, involves masking the insulating layer to form an etching area on the top. The insulating layer is subjected to etching process (I) using a fluorocarbon of formula: C_xF_y , before reaching the level of field oxide region (provided on a substrate (10)), to form a partially completed opening in insulating layer. Subsequently, the insulating layer is subjected to etching process (II) using hydrogen containing fluorocarbon along with component(s) of etching process (I) to form opening.

x = greater than 1

USE - For etching an opening in an insulating oxide layer of semiconductor device such as metal oxide semiconductor field effect transistor (MOSFET) used in dynamic random access memory (DRAM).

ADVANTAGE - The etching process (II) using hydrogen containing fluorocarbon provides a very good selectivity to field oxide regions while retains favorable nitride selectivity to the gate stack to be capable of etch completions down to the silicon substrate. Hence the method allows etching of doped oxide dielectric layer, self-aligned to the gate stacks, without substantially damaging the nitride layer of the gate stack or any misaligned underlying field oxide regions.

DESCRIPTION OF DRAWING(S) - The figure shows diagram of the semiconductor device.

Substrate 10

Insulating oxide layer 24

Opening 40

Dwg.4/5
FS CPI EPI GMPI
FA AB; GI

MC CPI: L04-C06; L04-C07B; L04-C07D; L04-C12A; L04-C12D; L04-E01B1
EPI: U11-C05E3; U11-C05G2C

L43 ANSWER 6 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-181280 [24] WPIX
DNN N2002-137758 DNC C2002-056451
TI Semiconductor device manufacture involves etching nitriding film using
mixture of carbon and fluorine gas.
DC L03 U11 V05
PA (NIDE) NEC CORP
CYC 1
PI JP 2001127039 A 20010511 (200224)* 5 H01L021-3065
ADT JP 2001127039 A JP 1999-302329 19991025
PRAI JP 1999-302329 19991025
IC ICM H01L021-3065
ICS H01L021-316
AB JP2001127039 A UPAB: 20020416
NOVELTY - A nitride film (4) is formed covering a polysilicon gate (2) and
WSi (3) which are formed on a substrate (1). An oxide film (5) that is
provided on nitride film is etched to form a vent by using mixed gas. Then
nitriding film is etched by using CxFy gas.

DETAILED DESCRIPTION - The CxFy mixed gas is chosen among the gases
of C3F6, C4F6, C4F8, **C5F8**, CH2F2, CH3F, CH3 or Br gas, NH3 gas,
C2H5OH, CH3OH or its additions.

USE - Manufacture of semiconductor device.

ADVANTAGE - Since etching gas group of interlayer oxide film is used
for nitriding film etching, sufficient etching is done without changing
atmosphere of etching chamber.

DESCRIPTION OF DRAWING(S) - The figure shows section of manufacture
of semiconductor device. (Drawing includes non-English language text).
Substrate 1

Polysilicon gate 2

WSi 3
Nitride film 4
Oxide film 5
Dwg.1/2

FS CPI EPI
FA AB; GI
MC CPI: L04-C07D; L04-C12B
EPI: U11-A10; U11-C05F1; U11-C07A1; U11-C07C3; U11-C07D2; V05-F05A

L43 ANSWER 7 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-057939 [08] WPIX
DNN N2002-042730 DNC C2002-016838
TI Production of highly pure 1,2,3,3,4,4,5,5-octafluorocyclopentene
, useful as plasma reaction gas, by fluorination of
chlorofluorocyclopentene mixture and subsequent complete fluorination.
DC E15 L03 U11
PA (JAPG) NIPPON ZEON KK
CYC 1
PI JP 2001247493 A 20010911 (200208)* 6 C07C017-20
ADT JP 2001247493 A JP 2000-63090 20000308
PRAI JP 2000-63090 20000308
IC ICM C07C017-20
ICS C07C023-08

AB JP2001247493 A UPAB: 20020204

NOVELTY - 1,2,3,3,4,4,5,5-**Octafluorocyclopentene** is produced by fluorinating a mixture of chlorofluorocyclopentenenes with metal fluoride in mixed solvent (polar and non-polar), distilling the crude product to isolate fraction A containing 1-chloroheptafluorocyclopentene and fraction B containing 1,3- and 1,4-dichlorohexafluorocyclopentenenes, and completely fluorinating A and/or B with metal fluoride.

DETAILED DESCRIPTION - Production of 1,2,3,3,4,4,5,5-**octafluorocyclopentene** consists of two steps:

(i) reacting a mixture of at least two chlorofluorocyclopentenenes of formula (I) and metal fluoride in the presence of a mixed solvent system consisting of polar and non-polar solvent to fluorinate the mixture, and distilling the crude product to isolate fraction A containing 1-chloroheptafluorocyclopentene and fraction B containing 1,3-dichloro-2,3,4,4,5,5-hexafluorocyclopentene and 1,4-dichloro-2,3,3,4,5,5-hexafluorocyclopentene and

(ii) reacting at least one of A and B with metal fluoride to completely fluorinate it.

x = 3-6.

USE - 1,2,3,3,4,4,5,5-**Octafluorocyclopentene** (OFCPE) is useful as plasma reaction gas (etching gas, ashing gas) in semiconductor device production.

ADVANTAGE - The first step forms 1-chloroheptafluorocyclopentene and, together with this, specifically 1,3- and 1,4-dichlorohexafluorocyclopentenenes as by-products. These can be easily isolated as fraction A and B by distillation and, as a result, other reaction impurities can be removed. Further, the second step completely fluorinates A and/or B gives OFCPE of high purity in good yield.

Dwg.0/0

FS CPI EPI

FA AB; GI; DCN

MC CPI: E10-H03A2; L04-C07D

EPI: U11-A12

=> d L42 1-7 all

L42 ANSWER 1 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2004-467290 [44] WPIX

DNN N2004-369184 DNC C2004-174984

TI Fabrication of semiconductor device comprises laying first oxide layer on prior layer, laying second oxide layer on first oxide layer, patterning layers, and **etching** first and second layers to first and second doped oxide layers.

DC L03 U11

IN YOUNG, J W

PA (YOUN-I) YOUNG J W

CYC 1

PI US 2004106300 A1 20040603 (200444)* 7 H01L021-302

ADT US 2004106300 A1 US 2002-306962 20021129

PRAI US 2002-306962 20021129

IC ICM H01L021-302

ICS H01L021-31; H01L021-461; H01L021-469

AB US2004106300 A UPAB: 20040712

NOVELTY - Semiconductor device is formed by laying on prior layer (10) a first oxide layer (16) doped in one form, laying on first oxide layer, a second oxide layer (18) doped in different form, patterning the layers, **etching** the second layer with an **etchant** having high

selectivity to second doped oxide layer, and **etching** the first layer with **etchant** having high selectivity to the first doped oxide layer.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(a) a machine for fabricating a semiconductor device; and

(b) a process for preparing **etchant** formulated for fabricating semiconductor device.

USE - For fabricating a semiconductor device to **etch** a contact hole (claimed).

ADVANTAGE - The method minimizes undesirable **etching** of substrate at certain location, depth, or layer while allowing **etchant** to remove all remaining unwanted residue material. It exhibits very high selectivity to the underlying layers and at a controllable rate to control up to a required critical dimension to prevent damage to the oxide or active area (12).

DESCRIPTION OF DRAWING(S) - The figure shows a pattern that is formed after soft-landing **etching** with another recipe.

Prior layer 10

Active area 12

Isolation field oxide 14

First oxide layer 16

Second oxide layer 18

Photoresist 20

Dwg.3/4

FS CPI EPI

FA AB; GI

MC CPI: L04-C02; L04-C06; L04-C07; L04-C12A

EPI: U11-C05D3; U11-C07A1; U11-C07C3

L42 ANSWER 2 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2004-184398 [18] WPIX

DNN N2004-146420 DNC C2004-073693

TI Optical element manufacturing method e.g. for use in color television, involves spraying ink on areas surrounded by dividing walls formed on substrate treated by specific gas in treatment chamber.

DC E16 L03 P75 P81 T04 U11 U14 W03 W04

PA (CANO) CANON KK

CYC 1

PI JP 2003344640 A 20031203 (200418)* 20 G02B005-20

ADT JP 2003344640 A JP 2002-155759 20020529

PRAI JP 2002-155759 20020529

IC ICM G02B005-20

ICS B41J002-01; G02F001-1333

AB JP2003344640 A UPAB: 20040316

NOVELTY - A substrate (1) coated with resin, is arranged in a treatment chamber at downstream side of a **plasma** generating apparatus. The resin layer (2) is treated such that it is not directly exposed to the reactive gas or neutral active type gas produced in the **plasma** generating apparatus, so as to form the dividing walls (3) on the substrate. Ink is sprayed using an inkjet system, on the areas (4) surrounded by the walls.

DETAILED DESCRIPTION - The areas surrounded by the dividing walls and the dividing walls are made to undergo hydrophilization treatment or preset treatment to obtain water-repellent property. The resin contains carbon black. The average roughness of the surface of the treated dividing wall, is 10 nm or less. The contact angle of ink on dividing wall surface after **plasma** processing operation, is 80 degrees or less. The contact angle of pure water with substrate surface, is 25 degrees or less.

The gas used for hydrophilization treatment, is selected from **oxygen**, argon, helium, **nitrogen** and **mixture** of halogen **gas** and **oxygen**. The blend ratio of **oxygen** with halogen gas, is 30% or less. The ink contains a hardening component, water and organic solvent. A color filter having black matrix is formed by the dividing walls on the transparent substrate. The optical element is an electroluminescent element having an electrode arranged vertically on both sides of the pixel which is a light emitting layer.

INDEPENDENT CLAIMS are also included for:

- (1) optical element; and
- (2) liquid crystal device.

USE - For manufacturing optical element (claimed) e.g. electroluminescent element of color television, personal computer and laptop, and liquid crystal device (claimed) used in pachinko amusement machine.

ADVANTAGE - A liquid crystal device excellent in color display characteristics is produced cheaply by forming light emitting layer with sufficient yield.

DESCRIPTION OF DRAWING(S) - The figure shows the sectional views of substrate during manufacture of optical element. (Drawing includes non-English language text).

substrate 1
resin layer 2
dividing wall 3
exposed area of substrate 4
Dwg.1/13

FS CPI EPI GMPI

FA AB; GI; DCN

MC CPI: E10-H04A3; E31-F05; L03-G02B; L03-G05B

EPI: T04-H03C2; T04-H03C3; U11-C18D; U14-K01A1C; W03-A08B; W03-A08J;
W04-X02A1

L42 ANSWER 3 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-555950 [52] WPIX

DNN N2003-441599 DNC C2003-150085

TI **Plasma etching** system, useful for semiconductor workpiece, has master flow controller connected to first and second gas flow controllers.

DC L03 T06 U11 V05

IN CELII, F G; JIANG, P

PA (CELI-I) CELII F G; (JIAN-I) JIANG P

CYC 1

PI US 2003073312 A1 20030417 (200352)* 8 H01L021-302

ADT US 2003073312 A1 Provisional US 2001-330237P 20011017, US 2002-263981
20021003

PRAI US 2001-330237P 20011017; US 2002-263981 20021003

IC ICM H01L021-302

ICS H01L021-461

AB US2003073312 A UPAB: 20030813

NOVELTY - A **plasma etching** system has a master flow controller (26) connected to the two gas flow controllers. The master flow controller controls the two gas controllers during the performance of the **etch** process to define the primary and secondary **etch** processes. The primary or secondary **etch** process increases the buffer layer thickness and the other **etch** process decreases the buffer layer thickness.

DETAILED DESCRIPTION - A **plasma etching** system

comprises a **plasma** reaction chamber (12); first and second gas sources (22); first and second gas flow controllers (24a-n) connected to the first and second gas sources (22a-n), respectively; a mixing manifold (18) connected between the reaction chamber and the outputs of the two gas flow controllers; and a master flow controller connected to the two gas flow controllers. The mixing manifold links a **mixture** of **gases** with the **plasma** reaction chamber. The master flow controller controls the two gas controllers during the **etching** process to define the primary and secondary **etch** processes. The first and second gas controllers control an amount of gas from the first and second gas sources, respectively. The primary or secondary **etch** process increases the buffer layer thickness and the other **etch** process decreases the buffer layer thickness. The buffer layer inhibits the **etch** rate of the first layer to a degree dependent on the thickness of the buffer layer.

An INDEPENDENT CLAIM is included for the fabrication of an integrated circuit comprising **etching** first layer on a semiconductor body using a primary or a secondary step to remove material from the first layer.

USE - Useful in **etching** semiconductor workpiece.

ADVANTAGE - The process has high degrees of selectivity in the manufacturing process that can **etch** one material at a higher rate than the other.

DESCRIPTION OF DRAWING(S) - The block diagram illustrates the **plasma**-enhanced chemical vapor **etch** system (PECVE) (10).

PECVE system 10

Reaction chamber 12

Mixing manifold 18

Gas sources 22a-n

Flow controller 24a-n

Master flow controller 26

Dwg.1/4

FS CPI EPI

FA AB; GI

MC CPI: L04-C07D; L04-C18; L04-D04

EPI: T06-B04; U11-C07A1; U11-C09C; U11-C15C; V05-F04E; V05-F05C;
V05-F05E5A; V05-F08E1

L42 ANSWER 4 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-075156 [07] WPIX

DNN N2003-058196 DNC C2003-019441

TI Semiconductor device manufacturing method e.g. DRAM, involves, **etching** interlayer insulating films and silicon nitride films sequentially to form contact hole.

DC L03 U11

IN UEDA, Y

PA (NIDE) NEC CORP; (HITA) HITACHI LTD; (NIDE) NEC ELECTRONICS CORP

CYC 5

PI US 2002155699 A1 20021024 (200307)* 19 H01L021-4763

JP 2002319551 A 20021031 (200307) 14 H01L021-28

KR 2002082158 A 20021030 (200319) H01L021-3205

CN 1383192 A 20021204 (200322) H01L021-31

TW 565890 A 20031211 (200434) H01L021-31

ADT US 2002155699 A1 US 2002-124389 20020418; JP 2002319551 A JP 2001-124260

20010423; KR 2002082158 A KR 2002-22251 20020423; CN 1383192 A CN

2002-118172 20020423; TW 565890 A TW 2002-108405 20020423

PRAI JP 2001-124260 20010423

IC ICM H01L021-28; H01L021-31; H01L021-3205; H01L021-4763

ICS H01L021-3065; H01L021-311; H01L021-318; H01L021-768
AB US2002155699 A UPAB: 20030129
NOVELTY - A silicon nitride (SiN) film and a metal film are sequentially formed on an interlayer insulation film formed on a semiconductor substrate (1). Another interlayer insulating and SiN films are formed after patterning the previously formed SiN film. A contact hole which extends towards the diffusion layer is formed by sequentially dry **etching** using an **etching** gas, the interlayer insulating films and the SiN films.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for semiconductor device.
USE - For manufacturing semiconductor devices e.g. super-high semiconductor memory devices such as 1-gigabit dynamic random access memory (GbDRAM).
ADVANTAGE - A contact hole is simply formed in self-aligned manner with a wiring layer, hence production of semiconductor devices is enhanced.
DESCRIPTION OF DRAWING(S) - The figure shows a cross-sectional view of the semiconductor device manufacturing method.
Semiconductor substrate 1
Dwg.3A/7
FS CPI EPI
FA AB; GI
MC CPI: L04-C06; L04-C07B; L04-C10; L04-C12; L04-C12B
EPI: U11-A08

L42 ANSWER 5 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-441394 [47] WPIX
DNN N2001-326557 DNC C2001-133262
TI **Plasma** processing system e.g. for semiconductor wafers has electromagnet arrangement supplied with variable direct current for radial variation in controlled magnetic field above substrate being processed.
DC E16 L03 U11 V05 X14
IN BAILEY, A D; HEMKER, D J; SCHOEPP, A M; WILCOXSON, M H
PA (LAMR-N) LAM RES CORP; (BAIL-I) BAILEY A D; (HEMK-I) HEMKER D J; (SCHO-I) SCHOEPP A M; (WILC-I) WILCOXSON M H
CYC 96
PI WO 2001037314 A1 20010525 (200147)* EN 54 H01J037-32
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ
NL OA PT SD SE SL SZ TR TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE DK DM
DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC
LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE
SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2001016061 A 20010530 (200152) H01J037-32
EP 1230664 A1 20020814 (200261) EN H01J037-32
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT
RO SE SI
KR 2002053080 A 20020704 (200302) H01J037-30
JP 2003514388 W 20030415 (200328) 62 H01L021-3065
TW 494434 A 20020711 (200328) H01J037-32
CN 1423824 A 20030611 (200357) H01J037-32
US 2004011467 A1 20040122 (200407) H01L021-306
ADT WO 2001037314 A1 WO 2000-US31229 20001114; AU 2001016061 A AU 2001-16061
20001114; EP 1230664 A1 EP 2000-978613 20001114, WO 2000-US31229 20001114;
KR 2002053080 A KR 2002-706111 20020513; JP 2003514388 W WO 2000-US31229
20001114, JP 2001-537770 20001114; TW 494434 A TW 2000-124189 20001115; CN
1423824 A CN 2000-818379 20001114; US 2004011467 A1 Div ex US 1999-440794

19991115, US 2003-618289 20030711
FDT AU 2001016061 A Based on WO 2001037314; EP 1230664 A1 Based on WO 2001037314; JP 2003514388 W Based on WO 2001037314
PRAI US 1999-440794 19991115; US 2003-618289 20030711
IC ICM H01J037-30; H01J037-32; H01L021-306; H01L021-3065
ICS C23C016-507
AB WO 200137314 A UPAB: 20010822
NOVELTY - **Plasma** processing system has electromagnet arrangement supplied with variable direct current for radial variation in controlled magnetic field above substrate being processed.
DETAILED DESCRIPTION - A coupling window is situated at the upper end of the **plasma** processing chamber (106). A radiofrequency (RF) antenna (102) is positioned above a substrate plane. An electromagnet arrangement (104) also positioned above the substrate plane is configured to result in radial variation in the controlled magnetic field within the chamber adjacent the window and antenna when at least one direct current is supplied to the arrangement. A direct current (DC) power supply (114) connected to the electromagnet arrangement has a controller to vary the magnitude of the current.
An INDEPENDENT CLAIM is also included for a method for controlling **plasma** processing uniformity using the apparatus.
USE - The **plasma** processing system is used for processing semiconductor wafers and the glass or plastic panels used in flat panel displays, by **etching** (all claimed).
ADVANTAGE - The radial variation in the controlled magnetic field results in uniform processing of the substrate (claimed). Different uniformity settings can be used for different **etching** processes, thus achieving a high degree of flexibility.
DESCRIPTION OF DRAWING(S) - The drawing shows a schematic view of the **plasma** processing system.
RF antenna 102
Electromagnet arrangement 104
Plasma processing chamber 106
RF power supply 112
DC power supply 114
Substrate 122
Bias RF power supply 128
Dwg.1/7
FS CPI EPI
FA AB; GI; DCN
MC CPI: E10-H04A3; E11-N; E31-B03B; E31-B03C; E31-D02; E31-F05; E31-H03; E31-H05; E31-J; E31-N05B; E31-N05C; E32-A02; L03-H04D; L04-D04
EPI: U11-C09C; V05-F04C1A; V05-F05C; V05-F08D1; X14-F

L42 ANSWER 6 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1999-450065 [38] WPIX
DNN N1999-336546 DNC C1999-132357
TI Dry **etching** of layer insulation film for forming self- adjusting contact - by supplying carbon fluoride gas and **nitrogen** gas at specific flow rates for selective **etching** of silicon oxide layer.
DC L03 U11
PA (TOKE) TOSHIBA KK
CYC 1
PI JP 11186229 A 19990709 (199938)* 11 H01L021-3065
ADT JP 11186229 A JP 1997-349366 19971218
PRAI JP 1997-349366 19971218
IC ICM H01L021-3065

AB JP 11186229 A UPAB: 19990922
NOVELTY - SiN layers (25a,25b) and SiO2 (26) formed over a Si substrate (21) are **etched** by **gas mixture** containing either one of C4F8, **C5F8** and CH2F2 and gas containing **nitrogen** are activated by **plasma**. The flow of gas supplied is set to ax divided by bz at least 1.9 and ay divided by bz at least 3.0 where z is number of **nitrogen** atoms per molecule in gas, y is number of F atoms and X is number of C atoms per molecule in gas.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for MOS semiconductor device production.

USE - For forming self-adjusting contact during manufacture of MOS semiconductor device.

ADVANTAGE - By controlling proportion of carbon to **nitrogen** and fluorine to **nitrogen** in reactant gases, Si oxide layer is selectively **etched** with selective **etching** ratio larger than that of the silicon nitride layer.

DESCRIPTION OF DRAWING(S) - The figure shows the **etching** process during semiconductor device manufacture. (21) Silicon substrate; (25a,25b) Silicon nitride layers; (26) Silicon oxide layer.

Dwg.8/14

FS CPI EPI
FA AB; GI
MC CPI: L04-C07B
EPI: U11-C05E3; U11-C07A1

L42 ANSWER 7 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1998-272529 [24] WPIX

DNN N1998-213918 DNC C1998-085160

TI **Gas composition** for **plasma** dry **etching** with no polymer precipitation - comprises perfluoro-cycloolefin and **oxygen** gas or gaseous oxygenic compound.

DC A85 E15 L03 U11

IN GOTO, K; SEKIYA, A; TAKAGAKI, T; YAMADA, T

PA (AGEN) AGENCY OF IND SCI & TECHNOLOGY; (ELIN-N) ELECTRONIC IND ASSOC JAPAN; (MECH-N) MECHANICAL SOCIAL SYSTEMS FOUND; (JAPG) NIPPON ZEON KK; (JAPG) JAPANESE GEON CO LTD; (NIDE-N) NIPPON DENSHI KIKAI KOGYOKAI SH; (KIKAI-N) ZH KIKAI SYSTEM SHINKO KYOKAI; (AGEN) KOKU UCHU GIJUTSU KENKYUSHO; (NIDE-N) NIHON DENSHI KIKAI KOGYOKAI SH; (ELIN-N) ELECTRONICS IND ASSOC

CYC 21

PI WO 9819331 A1 19980507 (199824)* JA 16 H01L021-302

RW: AT BE CH DE DK ES FI FR GB GR IE IT LU MC NL PT SE

W: KR US

JP 10199865 A 19980731 (199841) 6 H01L021-3065

EP 948033 A1 19991006 (199946) EN H01L021-302

R: DE FR GB

TW 401602 A 20000811 (200116) H01L021-302

KR 2000052931 A 20000825 (200121) H01L021-306

US 6322715 B1 20011127 (200175) C09K013-00

ADT WO 9819331 A1 WO 1997-JP3966 19971030; JP 10199865 A JP 1997-312907 19971030; EP 948033 A1 EP 1997-910616 19971030, WO 1997-JP3966 19971030; TW 401602 A TW 1997-116291 19971030; KR 2000052931 A WO 1997-JP3966 19971030, KR 1999-703801 19990429; US 6322715 B1 WO 1997-JP3966 19971030, US 1999-297071 19990430

FDT EP 948033 A1 Based on WO 9819331; KR 2000052931 A Based on WO 9819331; US 6322715 B1 Based on WO 9819331

PRAI JP 1996-305819 19961030

IC ICM C09K013-00; H01L021-302; H01L021-306; H01L021-3065

ICS C23F004-00

AB WO 9819331 A UPAB: 19980617

A **gas composition** for dry **etching** comprises:

(a) a perfluorocycloolefin (A); and (b) 1-40 molar% (based on A) of at least one oxygenic component from **oxygen** gas and gaseous oxygenic compounds.

Preferably the oxygenic component is 3-30 (especially 5-15) molar%. The composition also contains at most 50 (especially 30) molar% (per total **gas composition**) of a saturated hydrofluorocarbon (especially a linear, branched or cyclic saturated hydrocarbon having at least half of its hydrogens substituted with fluorine). (A) has 3-8 (especially 4-6) C atoms. (A) is perfluorocyclobutene, **perfluorocyclopentene** or perfluorocyclohexene. The oxygenic component is **oxygen** gas or it is carbon oxide gas, **nitrogen** oxide gas or sulphur oxide gas.

USE - For dry **etching** methods (claimed).

ADVANTAGE - The gas can be used for high speed **etching**, and gives high selectivity for protective films such as photoresist and polysilicon; generation of thin film polymer precipitates during **etching** is completely avoided; and it is not necessary to have wafer cooling nor cooled **etching** apparatus.

Dwg.0/0

FS CPI EPI

FA AB; DCN

MC CPI: A11-C04E; E10-H04A2; E31-D02; E31-F04; E31-H05; E31-N05B; E31-N05C;

L04-C07D

EPI: U11-A12; U11-C07A

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FILE LAST UPDATED: 2 AUG 2004 <20040802/UP>

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L55 ANSWER 1 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2002-231906 JAPIO

TITLE: SEMICONDUCTOR DEVICE AND ITS MANUFACTURING METHOD

INVENTOR: MATSUMOTO JUNKO

PATENT ASSIGNEE(S): MITSUBISHI ELECTRIC CORP

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002231906	A	20020816	Heisei	H01L027-108

APPLICATION INFORMATION

STN FORMAT: JP 2001-22881 20010131

ORIGINAL: JP2001022881 Heisei

PRIORITY APPLN. INFO.: JP 2001-22881 20010131

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-231906 JAPIO

AB PROBLEM TO BE SOLVED: To form a connection hole 27 for connecting a storage node to a semiconductor substrate 1 to a bit line 24 in self-alignment manner, in a DRAM semiconductor device that provides the bit line 24 in a direction for crossing a word line 17 in the upper layer of the word line 17, and additionally provides the storage node of a capacitor in the farther upper layer thereof.

SOLUTION: An opening 21 opened in self-alignment manner is buried between the word lines 18 for forming a plug electrode 22. By reactive ion **etching** using an Ar/C5F8/CH2F2 gas, interlayer oxide films 23 and 26 are opened in self-alignment manner to the bit line 24 covered with a silicon nitride film 25 for forming the connection hole 27 that reaches the plug electrode 22. Contact area is secured by allowing the end section of the connection hole 27 to deviate from the plug electrode 22 in a direction parallel with a bit line wiring direction when the connection hole is opened. **Etching** stop is carried out by a silicon nitride film 19 for covering the work line 17 in a lower layer.

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IC ICM H01L027-108

ICS H01L021-8242; H01L021-28; H01L021-3213; H01L021-768

=> d L55 2-13 ibib abs ind

L55 ANSWER 2 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2002-217286 JAPIO

TITLE: MANUFACTURING METHOD OF SEMICONDUCTOR DEVICE

INVENTOR: ISHIDA KATSUHIRO; ITO KATSUYA

PATENT ASSIGNEE(S): TOSHIBA CORP

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002217286	A	20020802	Heisei	H01L021-768

APPLICATION INFORMATION

STN FORMAT: JP 2001-7970 20010116

ORIGINAL: JP2001007970 Heisei

PRIORITY APPLN. INFO.: JP 2001-7970 20010116

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-217286 JAPIO

AB PROBLEM TO BE SOLVED: To provide a method for manufacturing a semiconductor device wherein a short circuit between an upper layer wiring and a lower layer wiring is prevented by selectively **etching**, among laminated insulating films, such insulating films as containing more impurities instead of such insulating films as containing less impurities.

SOLUTION: At least two kinds of insulating film of different impurity content are **deposited** on a semiconductor substrate. A second insulating film containing impurities more than a first insulating film, among at least two kinds of insulating films, is selectively **etched** using **etching** gas containing O2, while the first insulating film is selectively **etched** using **etching** gas containing C5F8 of which the volume is more than that of O2.

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IC ICM H01L021-768

ICS H01L021-3065; H01L029-78; H01L021-336

L55 ANSWER 3 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2002-134479 JAPIO
TITLE: METHOD FOR MANUFACTURING SEMICONDUCTOR DEVICE
INVENTOR: ANDO ATSUHIRO; NUNOFUJI WATARU
PATENT ASSIGNEE(S): SONY CORP
FUJITSU LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002134479	A	20020510	Heisei	H01L021-3065

APPLICATION INFORMATION

STN FORMAT: JP 2000-325954 20001025
ORIGINAL: JP2000325954 Heisei
PRIORITY APPLN. INFO.: JP 2000-325954 20001025
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2002

AN 2002-134479 JAPIO

AB PROBLEM TO BE SOLVED: To form a connecting hole communicating with a wiring material, having low **plasma** resistance by suppressing increase in a contact resistance, without depending on the area or the depth of an opening, and assuring a processing capability.
SOLUTION: A method for manufacturing a semiconductor device comprises the steps of forming an insulating film on a board 10, by using a mixed gas of an octafluorocyclobutane (C4F8) or an **octafluorocyclopentene** (C5F8), a carbon monoxide (CO), **oxygen** (O2) and argon (Ar) and processing an insulating film (a second insulating film 24). In this method, supply flow rate of the octafluorocyclobutane (C4F8) or the **octafluorocyclopentene** is set to 15 to 25 cm3/min.
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IC ICM H01L021-3065
ICS H01L021-28; H01L021-3213; H01L021-768

L55 ANSWER 4 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2002-110647 JAPIO
TITLE: MANUFACTURING METHOD OF SEMICONDUCTOR INTEGRATED
CIRCUIT DEVICE
INVENTOR: IKEDA TAKENOBU; TADOKORO MASAHIRO; IZAWA MASARU;
YUNOGAMI TAKASHI
PATENT ASSIGNEE(S): HITACHI LTD
NEC CORP

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002110647	A	20020412	Heisei	H01L021-3065

APPLICATION INFORMATION

STN FORMAT: JP 2000-299854 20000929
ORIGINAL: JP2000299854 Heisei
PRIORITY APPLN. INFO.: JP 2000-299854 20000929
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2002

AN 2002-110647 JAPIO

AB PROBLEM TO BE SOLVED: To form a groove or a hole of high aspect ratio.
SOLUTION: When a hole 3 is shaped in an insulation film 1 through

selectively **etching** the insulation film 1 subjecting it to **plasma etching** treatment, by using **C5F8**, **O2** and Ar **etching** gas for the insulation film 1 formed of silicon oxide, **etching** treatment is at first performed under conditions of weak **deposition** characteristics of a polymer layer and then is successively subjected to, with switching of the conditions to one of strong **deposition** characteristics.

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IC ICM H01L021-3065

ICS H01L021-28; H01L021-768; H01L027-108; H01L021-8242

L55 ANSWER 5 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2002-025979 JAPIO

TITLE: METHOD OF MANUFACTURING SEMICONDUCTOR INTEGRATED CIRCUIT DEVICE

INVENTOR: TADOKORO MASAHIRO; SHIOYA MASAHIRO; KOJIMA MASAYUKI; IKEDA TAKENOBU

PATENT ASSIGNEE(S): HITACHI LTD

HITACHI ULSI SYSTEMS CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002025979	A	20020125	Heisei	H01L021-3065

APPLICATION INFORMATION

STN FORMAT: JP 2000-200986 20000703

ORIGINAL: JP2000200986 Heisei

PRIORITY APPLN. INFO.: JP 2000-200986 20000703

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-025979 JAPIO

AB PROBLEM TO BE SOLVED: To enable a silicon oxide film to be improved in borability of a silicon oxide film and selectivity against a nitride film in an SAC process or an HARC process.

SOLUTION: A silicon oxide film 3d is formed on a semiconductor substrate 2S, and when contact holes 14a and 14b are bored in the oxide film 3d by **plasma etching**, an **etching** gas (**C5F8**

/O2/Ar) of low pressure is fed at a very high flow rate, by which the retention time of the **etching** gas in a chamber is set at a specific value at which the oxide film 3d is improved in selectivity against a silicon nitride insulating film 8c.

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IC ICM H01L021-3065

ICS H01L021-28; H01L021-768; H01L027-108; H01L021-8242

L55 ANSWER 6 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2001-257261 JAPIO

TITLE: METHOD OF MANUFACTURING SEMICONDUCTOR DEVICE

INVENTOR: JIWARI NOBUHIRO; NIKAWA HIDEO; SAKAMOTO MASANORI

PATENT ASSIGNEE(S): MATSUSHITA ELECTRIC IND CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001257261	A	20010921	Heisei	H01L021-768

APPLICATION INFORMATION

STN FORMAT: JP 2000-64924 20000309
ORIGINAL: JP2000064924 Heisei
PRIORITY APPLN. INFO.: JP 2000-64924 20000309
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2001

AN 2001-257261 JAPIO

AB PROBLEM TO BE SOLVED: To improve the shape of a contact hole and simplify burying a metal.

SOLUTION: After patterning a photo resist 3 in the form of contact holes on a silicon oxide film 2, fine contact holes are formed using a mixed gas of **C5F8**, Ar and **o2**, the resist 3 is removed by ashing, and water vapor is introduced at a fixed flow rate in an **etching** chamber to react water vapor with fluorine remaining on the contact hole tops to form hydrofluoric acid, resulting in that the eaves 5 of the contact hole tops are wet **etched** to broadening the openings, thereby facilitating a metal burying process.

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IC ICM H01L021-768

ICS H01L021-28; H01L021-3065

L55 ANSWER 7 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2001-144081 JAPIO

TITLE: **ETCHING METHOD**

INVENTOR: ADACHI KENJI; SANO MICHIAKI

PATENT ASSIGNEE(S): TOKYO ELECTRON LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001144081	A	20010525	Heisei	H01L021-3065

APPLICATION INFORMATION

STN FORMAT: JP 2000-265131 20000901
ORIGINAL: JP2000265131 Heisei
PRIORITY APPLN. INFO.: JP 1999-247485 19990901
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2001

AN 2001-144081 JAPIO

AB PROBLEM TO BE SOLVED: To provide an **etching** method with which a resist selection ratio can be improved and an **etching** shape can be improved.

SOLUTION: A treatment gas is introduced into an airtight treatment chamber 104 to form an SiO₂ layer formed on a wafer W placed in the chamber. In this method of **etching** this SiO₂ layer, the treatment gas contains at least **C5F8** and CH₂F₂. The flow ratio of **C5F8** and CH₂F₂ in the treatment gas is substantially 1/4 ≤ (flow rate of **C5F8**/flow rate of CH₂F₂) < 1/2. Since the treatment gas containing **C5F8** and CH₂F₂ is used, the resist selection ratio can be improved. Furthermore, when the flow ratio of **C5F8** and CH₂F₂ is substantially 1/4 or higher, abnormal shapes in vertical lines or meanders of formed grooves can be prevented. If the flow ratio of **C5F8** and CH₂F₂ is substantially 1/2 or lower, abnormal shapes due to bowing of the formed grooves can be prevented.

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IC ICM H01L021-3065

ICS H01L021-768

L55 ANSWER 8 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2001-135633 JAPIO
TITLE: METHOD OF MANUFACTURING SEMICONDUCTOR DEVICE
INVENTOR: JIWARI NOBUHIRO; IMAI SHINICHI
PATENT ASSIGNEE(S): MATSUSHITA ELECTRONICS INDUSTRY CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001135633	A	20010518	Heisei	H01L021-314

APPLICATION INFORMATION

STN FORMAT: JP 1999-319087 19991110
ORIGINAL: JP11319087 Heisei
PRIORITY APPLN. INFO.: JP 1999-319087 19991110
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2001

AN 2001-135633 JAPIO

AB PROBLEM TO BE SOLVED: To constitute an organic film containing fluorine in a fine structure without carrying a semiconductor substrate, where the organic film containing fluorine is stacked, from a film growth device to other processor.

SOLUTION: A first silicon oxide film 101, a metallic film 102, and a second silicon oxide film 103 are formed in order on a semiconductor substrate 100. Then dry **etching** is performed with a resist patter 104 as a mask and besides using the **etching** gas having **C5F8** as its main components, so as to form a hard mask 105 consisting of the second silicon oxide film 103. Metallic wiring 106 is formed by **etching** the metallic film 102 with the hard mask 105 as a mask, and then an interlayer insulating film 107 containing fluorine is stacked between the metallic wirings 106 and on the topside, using the material gas having **C5F8** gas for its main components.

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IC ICM H01L021-314

ICS H01L021-3065; H01L021-768; H05H001-46

L55 ANSWER 9 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2001-135630 JAPIO
TITLE: METHOD OF MANUFACTURING SEMICONDUCTOR DEVICE
INVENTOR: JIWARI NOBUHIRO; IMAI SHINICHI
PATENT ASSIGNEE(S): MATSUSHITA ELECTRONICS INDUSTRY CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001135630	A	20010518	Heisei	H01L021-312

APPLICATION INFORMATION

STN FORMAT: JP 1999-319086 19991110
ORIGINAL: JP11319086 Heisei
PRIORITY APPLN. INFO.: JP 1999-319086 19991110
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2001

AN 2001-135630 JAPIO

AB PROBLEM TO BE SOLVED: To stack an organic film containing fluorine without complicated film growth processes and without incurring the earth warming.

SOLUTION: A first silicon oxide film 101, a metallic film 102, and a second silicon oxide film 103 are formed in order on a semiconductor substrate 100. Then dry **etching** is performed with a resist

pattern 104 as a mask and besides using the **etching** gas having **C5F8** for its main components, so as to form a hard mask 105 consisting of the second silicon oxide film 103. Metal wiring 106 is formed by dry **etching** the metallic film 102 with the hard mask 105 as a mask, and then an interlayer insulating film 107 consisting of an organic film containing fluorine is stacked between the fellow metal wirings 106 and on the topside, using the material gas having **C5F8** gas as its main components.

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IC ICM H01L021-312

ICS H01L021-28; H01L021-3065; H01L021-31; H01L021-3213; H01L021-768

L55 ANSWER 10 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2000-349071 JAPIO

TITLE: CHEMICAL DRY **ETCHING**

INVENTOR: SATO KOICHI; JINBO SADAYUKI; YOSHIDA YUKIMASA; MUTO MAKOTO; TAZAWA YASUSHI

PATENT ASSIGNEE(S): SHIBAURA MECHATRONICS CORP
TOSHIBA CORP

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000349071	A	20001215	Heisei	H01L021-3065

APPLICATION INFORMATION

STN FORMAT: JP 1999-156422 19990603

ORIGINAL: JP11156422 Heisei

PRIORITY APPLN. INFO.: JP 1999-156422 19990603

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000

AN 2000-349071 JAPIO

AB PROBLEM TO BE SOLVED: To obtain a dry **etching** method which can reduce the amount of PFC discharged in the **etching** and to have less effects on global warming phenomenon, by using an **etching** gas having a short atmosphere life and GWP.
SOLUTION: A **mixture gas** containing **oxygen**, octafluorocyclopentane (**C5F8**) and **nitrogen** as necessary is activated, and then a semiconductor substrate 9 and a film formed on the substrate are subjected to a dry **etching** process within an **etching** chamber 5 with use of the activated gas. A gas of **C5F8** is used as an **etching** gas having short atmospheric life-time and GWP. Thereby the amount of PFC emitted during the **etching** operation can be reduced to have less effects on global warming phenomenon. The gas of **C5F8** having short atmosphere life and GWP used as an alternate gas is expected as gas material for the purpose of reducing the amount of PFC gas.

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IC ICM H01L021-3065

ICS H01L021-768

L55 ANSWER 11 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2000-332001 JAPIO

TITLE: GAS FOR **PLASMA** REACTION AND MANUFACTURE THEREOF

INVENTOR: HIRAYAMA TOSHITATSU; YAMADA TOSHIRO; SUGIMOTO TATSUYA; SUGAWARA MITSURU

PATENT ASSIGNEE(S): NIPPON ZEON CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000332001	A	20001130	Heisei	H01L021-3065

inventor

APPLICATION INFORMATION

STN FORMAT: JP 1999-143562 19990524 ✓
ORIGINAL: JP11143562 Heisei
PRIORITY APPLN. INFO.: JP 1999-143562 19990524
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2000

AN 2000-332001 JAPIO

AB PROBLEM TO BE SOLVED: To provide a gas for **plasma** reaction, consisting of **octafluorocyclopentene**, having improved **etching** performance and a manufacturing method thereof.
SOLUTION: The purity of **octafluorocyclopentene** in this gas is not less than 99.9 volume% with respect to the total amount of the gas, and the total amount of **nitrogen** and **oxygen** contained as very small amount of residual gas components is not more than 200 volume **ppm**, and thus this gas is a high purity uniform gas for **plasma** reaction. This high purity gas for **plasma** reaction can be manufactured through specific processes for processing crude **octafluorocyclopentene** and is useful for **plasma etching**, **plasma** CVD, and **plasma** ashing, etc. Furthermore, the water content of this gas is preferably not more than 20 wt. **ppm**.

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IC ICM H01L021-3065

ICS H01L021-205

L55 ANSWER 12 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1998-199866 JAPIO

TITLE: DRY-**ETCHING** METHOD

INVENTOR: SEKIYA AKIRA; YAMADA TOSHIRO; GOTO KUNIAKI; TAKAGAKI TETSUYA

PATENT ASSIGNEE(S): AGENCY OF IND SCIENCE & TECHNOL
KIKAI SYST SHINKO KYOKAI
NIPPON DENSHI KIKAI KOGYOKAI
NIPPON ZEON CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 10199866	A	19980731	Heisei	H01L021-3065

APPLICATION INFORMATION

STN FORMAT: JP 1997-312908 19971030
ORIGINAL: JP09312908 Heisei
PRIORITY APPLN. INFO.: JP 1996-305820 19961030
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 1998

AN 1998-199866 JAPIO

AB PROBLEM TO BE SOLVED: To enhance selectivity to the protection film of a photoresist and polysilicon and to realize high-speed **etching** by generating the **plasma** of a specified high density range by using **etching** gas containing perfluorocycloolefin.
SOLUTION: A **plasma** of high density range of not less than

10<SP>10</SP>cm<SP>-3</SP> is generated by using dry-etching gas containing perfluorocycloolefin, and a substrate to be etched is dry-etched. Perfluorocyclopentene, etc., is most preferable as the perfluorocycloolefin. The density of about 10<SP>10</SP>-10<SP>12</SP>cm<SP>-3</SP> is especially preferable as the plasma, emitted at the time of etching. The pressure of gas composition containing dry etching gas and other gas which is preferably used together is 10<SP>-2</SP>-10<SP>-3</SP>Torr, and the temperature reached for the etched substrate is preferably 80-200°C.

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IC ICM H01L021-3065
ICS C23F004-00

L55 ANSWER 13 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1996-245579 JAPIO

TITLE: DIARYLETHENE PHOTOCHROMIC COMPOUND AND OPTICALLY
RECORDING MATERIAL USING THE COMPOUND

INVENTOR: IRIE MASAHIRO

PATENT ASSIGNEE(S): IRIE MASAHIRO

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 08245579	A	19960924	Heisei	C07D207-333

APPLICATION INFORMATION

STN FORMAT: JP 1995-51569 19950310

ORIGINAL: JP07051569 Heisei

PRIORITY APPLN. INFO.: JP 1995-51569 19950310

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 1996

AN 1996-245579 JAPIO

AB PURPOSE: To obtain the component useful as an optically recording material.

CONSTITUTION: A compound of formula I (the ring B is a cyclic hydrocarbon group, a heterocyclic group; R is H, an alkyl, an aryl, a cycloalkyl; the carbon atoms on the rings C and D may have substituents, respectively, or may form condensed rings together with the carbon atoms on the same rings). The compound of formula I is obtained e.g. by dropping a n-BuLi hexane solution on a compound of formula II and subsequently adding perfluorocyclopentene to the reaction product. An optically recording material having a recording layer containing the compound of formula I is obtained by dispersing or dissolving the compound of formula I in a solvent (e.g. carbon tetrachloride), if necessary, together with a binder such as a polyester resin and subsequently coating the obtained dispersion or solution on a substrate, or forming the recording layer on the substrate by a vacuum-deposition method or a vacuum-codeposition method. The optically recording material is excellent in semiconductor laser sensitivity, non-destructive read, record thermal stability, high response speed, repeating durability, etc.

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IC ICM C07D207-333

ICS C07D209-10; C07D277-22; C07D277-24; C07D307-38; C07D307-42;
C07D333-12; C07D333-18; C07D333-24; C07D333-28; C07D333-36;
C07D333-38; C07D333-48; C07D333-54; C07D333-74; C07D345-00;
C07D409-08; C07D409-14; C07D409-14; C07D409-14; C07D417-14;
C07D417-14; C07D417-14; C07D487-04; C07D495-04; C07D495-04;

C07D519-00; C09K009-02; G03C001-73; G11B007-24
ICI C07D409-08, C07D307:38, C07D333:16

=> => file compendex,inspec

FILE 'COMPENDEX' ENTERED AT 15:03:08 ON 05 AUG 2004

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=> d L80 1-6 all

L80 ANSWER 1 OF 6 COMPENDEX COPYRIGHT 2004 EEI on STN

AN 2004(31):5807 COMPENDEX

TI **Plasma** copolymerization of C6F6/C5F8 for application of low-dielectric-constant fluorinated amorphous carbon films and its gas-phase diagnostics using in situ fourier transform infrared spectroscopy.

AU Shirafuji, Tatsuru (International Innovation Center Kyoto University, Sakyo-Ku, Kyoto 606-8501, Japan); Tsuchino, Akio; Nakamura, Toshihiro; Tachibana, Kunihide

SO Japanese Journal of Applied Physics, Part 1: Regular Papers and Short Notes and Review Papers v 43 n 5 A May 2004 2004.p 2697-2703
CODEN: JAPNDE ISSN: 0021-4922

PY 2004

DT Journal

TC Theoretical; Experimental

LA English

AB Low-dielectric-constant fluorinated amorphous carbon films have been prepared from a C6F6 and **C5F8 gas mixture** by an inductively coupled **plasma**-enhanced chemical vapor **deposition** method. The films from 100% **C5F8** have volatile nature, and they are vaporized by heating to 400deg C. On the other hand, the films prepared with 100% C6F6 have higher thermal stability. After the thermal treatment of the composite films, the dielectric constant of the films is reduced to 1.6, although the residual thickness of the films is not 100%. This result suggests that the residue from C5 F8 is vaporized by thermal treatment and voids are formed in the films. Void concentration in the films is estimated to be 40-60%. The structural change due to the thermal treatment stops after 5-10 min, and no marked structural changes are observed after further thermal treatment at 400deg C. The higher thermal stability of the films prepared with C6F6 has been attributed to the incorporation of the aromatic ring structure in the films. The gas-phase diagnostics of the **deposition** processes and the structural analysis of the films have suggested that C6F6 is highly polymerizable and its ring structure can be incorporated in the films. 19 Refs.

CC 933.2 Amorphous Solids; 804 Chemical Products Generally; 708.1 Dielectric Materials; 815.2 Polymerization; 802.2 Chemical Reactions; 932.3 Plasma Physics

CT *Amorphous films; X ray photoelectron spectroscopy; Fourier transform infrared spectroscopy; ULSI circuits; Porous materials; Heating; Thermodynamic stability; Carbon; Permittivity; Fluorine; Copolymerization; **Plasma** enhanced chemical vapor **deposition**

ST C6F6; **C5F8**; Low dielectric constant; Aromatic carbon rings
ET C*F; C6F; C cp; cp; F cp; C5F; C; C6F6/C5F

L80 ANSWER 2 OF 6 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 2003(51):1003 COMPENDEX
TI Predictable topography simulation of SiO2 **etching** by
C5F8 gas combined with a **plasma** simulation, sheath model
and chemical reaction model.
AU Takagi, S. (Corporate Manufacturing Eng. Ctr. Toshiba Corporation,
Isogo-ku, Yokohama, Kanagawa, Japan); Onoue, S.; Iyanagi, K.; Nishitani,
K.; Shinmura, T.; Kanoh, M.; Itoh, H.; Shioyama, Y.; Akiyama, T.;
Kishigami, D.
SO Plasma Sources Science and Technology v 12 n 4 November 2003 2003.p
S64-S71
CODEN: PSTEEU ISSN: 0963-0252
PY 2003
DT Journal
TC Theoretical; Experimental
LA English
AB We have developed a simulation for predicting reactive ion **etching**
(RIE) topography, which is a combination of **plasma** simulation,
the gas reaction model, the sheath model and the surface reaction model.
The simulation is applied to the SiO2 **etching** process of a
high-aspect-ratio contact hole using **C5F8** gas. A capacitively
coupled **plasma** (CCP) reactor of an 8-in. wafer was used in the
etching experiments. The baseline conditions are RF power of 1500
W and gas pressure of 4.0 Pa in a **gas mixture** of Ar,
O2 and C5F8. The **plasma** simulation reproduces the
tendency that CF2 radical density increases rapidly and the electron
density decreases gradually with increasing gas flow rate of **C5F8**
. In the RIE topography simulation, the **etching** profiles such as
bowing and taper shape at the bottom are reproduced in deep holes with
aspect ratios greater than 19. Moreover, the **etching** profile,
the dependence of the **etch** depth on the **etching** time,
and the bottom diameter can be predicted by this simulation. 24 Refs.
CC 804.2 Inorganic Components; 802.2 Chemical Reactions; 804.1 Organic
Components; 723.5 Computer Applications; 932.3 Plasma Physics; 931.2
Physical Properties of Gases, Liquids and Solids
CT *Silica; Electronic density of states; **Plasmas**; Reaction
kinetics; Surface properties; Mathematical models; Free radicals; Reactive
ion **etching**; Fluorocarbons; Computer simulation
ST Sheath model; Chemical reaction model; Capacitively coupled **plasma**
ET O*Si; SiO; Si cp; cp; O cp; C*F; C5F; C cp; F cp; Ar; O

L80 ANSWER 3 OF 6 INSPEC (C) 2004 IEE on STN
AN 2004:7952593 INSPEC DN A2004-12-8115H-014; B2004-06-0520F-032
TI **plasma** CVD of low-k a-C:F films using C6F6/**C5F8**.
AU Tsuchino, A. (Dept. of Electron. Sci. & Eng., Kyoto Univ., Japan);
Shirafuji, T.; Nakamura, T.; Tachibana, K.
SO Joint Conference ESCAM PIG 16. Sixteenth European Conference on Atomic and
Molecular Physics of Ionized Gases. ICRP 5 Fifth International Conference
on Reactive Plasma. Conference Proceedings
Editor(s): Sadeghi, N.; Sugai, H.
Grenoble, France: Univ. Joseph Fourier, 2002. p.205-6 vol.2 of 2
vol.(xiii+399+xii+381) pp. 4 refs.
Conference: Grenoble, France, 14-18 July 2002
DT Conference Article
TC Experimental

CY France
LA English
AB Low-dielectric-constant fluorinated amorphous carbon films have been prepared from C6F6 and **C5F8 gas mixture** by an inductively coupled **plasma** enhanced chemical vapor **deposition** method. The films from 100% **C5F8** has volatile nature, and they are vaporized by heating upto 400 degrees C. On the other hand, the films from 100% C6F6 has higher thermal stability. The films prepared from mixture of C6F6 and **C5F8** show composite structure of 100% C6F6 and 100% **C5F8** films. After thermal treatment of the composite films, the component from **C5F8** has been preferentially removed, and the dielectric constant of the films has been reduced to 1.6, although residual thickness of the films are not 100%. These results indicate that the tissue from **C5F8** are vaporized by the thermal treatment preferentially and voids are formed in the films.

CC A8115H Chemical vapour deposition; A7755 Dielectric thin films; A5275R Plasma applications in manufacturing and materials processing; A6855 Thin film growth, structure, and epitaxy; A7720 Dielectric permittivity; A8140G Other heat and thermomechanical treatments; A6170Q Inclusions and voids; B0520F Chemical vapour deposition; B2810 Dielectric materials and properties

CT AMORPHOUS STATE; CARBON; DIELECTRIC THIN FILMS; **GAS MIXTURES**; HEAT TREATMENT; PERMITTIVITY; **PLASMA** CVD; THERMAL STABILITY; VOIDS (SOLID)

ST **plasma CVD**; dielectric thin films; dielectric constant; fluorinated amorphous carbon films; **C6F6-C5F8 gas mixture**; **inductively coupled plasma enhanced chemical vapor deposition**; volatile nature; vaporization; heating; thermal stability; composite structure; thermal treatment; composite films; voids; residual thickness; 400 degC; C:F

CHI C:F bin, C bin, F bin, C el, F el, F dop
PHP temperature 6.73E+02 K
ET C*F; C:F; F doping; doped materials; C6F6/C5F8; C cp; cp; F cp; C6F6; C5F8; C; C6F; C6F6-C5F8

L80 ANSWER 4 OF 6 INSPEC (C) 2004 IEE on STN'
AN 2004:7904631 INSPEC DN A2004-09-8160C-014
TI Predictable topography simulation of SiO2 **etching** by **C5F8** gas combined with a **plasma** simulation, sheath model and chemical reaction model.

AU Takagi, S.; Onoue, S.; Iyanagi, K.; Nishitani, K.; Shinmura, T.; Kanoh, M. (Corporate Manuf. Eng. Center, Toshiba Corp., Kanagawa, Japan); Itoh, H.; Shioyama, Y.; Akiyama, T.; Kishigami, D.

SO Plasma Sources, Science and Technology (Nov. 2003) vol.12, no.4, p.S64-71. 24 refs.
Doc. No.: S0963-0252(03)67267-1
Published by: IOP Publishing
Price: CCCC 0963-0252/03/040064+08\$30.00
CODEN: PSTEEU ISSN: 0963-0252
SICI: 0963-0252(200311)12:4L.s64:PTSS;1-U
Conference: 16th Europhysics Conference on Atomic and Molecular Physics of Ionised Gases (ESCAM PIG) and 5th International Conference on Reactive Plasmas. Grenoble, France, 14-18 July 2002

DT Conference Article; Journal
TC Theoretical; Experimental
CY United Kingdom
LA English
AB We have developed a simulation for predicting reactive ion **etching**

(RIE) topography, which is a combination of **plasma** simulation, the gas reaction model, the sheath model and the surface reaction model. The simulation is applied to the SiO₂ **etching** process of a high-aspect-ratio contact hole using **C5F8** gas. A capacitively coupled **plasma** (CCP) reactor of an 8-in. wafer was used in the **etching** experiments. The baseline conditions are RF power of 1500 W and gas pressure of 4.0 Pa in a **gas mixture** of Ar, O₂ and **C5F8**. The **plasma** simulation reproduces the tendency that CF₂ radical density increases rapidly and the electron density decreases gradually with increasing gas flow rate of **C5F8**. In the RIE topography simulation, the **etching** profiles such as bowing and taper shape at the bottom are reproduced in deep holes with aspect ratios greater than 19. Moreover, the **etching** profile, the dependence of the **etch** depth on the **etching** time, and the bottom diameter can be predicted by this simulation.

CC A8160C Surface treatment and degradation in semiconductor technology; A5275R Plasma applications in manufacturing and materials processing; A5265 Plasma simulation; A8240Q Plasma reactions; A5240K Plasma sheaths; A0250 Probability theory, stochastic processes, and statistics

CT MONTE CARLO METHODS; **PLASMA** CHEMISTRY; **PLASMA** SHEATHS; **PLASMA** SIMULATION; SILICON COMPOUNDS; SPUTTER **ETCHING**; SURFACE CHEMISTRY; SURFACE TOPOGRAPHY

ST **plasma simulation**; sheath model; chemical reaction model; topography simulation; **reactive ion etching**; surface reaction model; high-aspect-ratio contact hole; **capacitively coupled plasma reactor**; radical density; **etching profiles**; bowing shape; taper shape; particle-in-cell Monte Carlo collision; SiO₂

CHI SiO₂ sur, O₂ sur, Si sur, O sur, SiO₂ bin, O₂ bin, Si bin, O bin

ET O*Si; SiO₂; Si cp; cp; O cp; C*F; C5F8; C cp; F cp; Ar; O₂; CF₂; SiO; O; Si

L80 ANSWER 5 OF 6 INSPEC (C) 2004 IEE on STN

AN 2001:6930651 INSPEC DN A2001-12-8115H-050

TI **Plasma** CVD of low-k a-C:F films using substitutional PFC.

AU Shirafuji, T.; Hayashi, Y.; Nishino, S. (Dept. of Electron. & Inf. Sci., Kyoto Inst. of Technol., Japan)

SO Advanced Metallization Conference 1999 (AMC 1999). Proceedings of the Conference
Editor(s): Gross, M.E.; Gessner, T.; Kobayashi, N.; Yasuda, Y.
Warrendale, PA, USA: Mater. Res. Soc, 2000. p.425-30 of xxii+763 pp. 12 refs.
Conference: Orlando, FL, USA, 28-30 Sept 1999
Sponsor(s): Continuing Educ. Eng.; Univ. Extension; Univ. California at Berkeley
ISBN: 1-55899-539-0

DT Conference Article

TC Experimental

CY United States

LA English

AB Low-k a-C:F films have been prepared from the low-GWP substitutional fluorocarbon source of **C5F8** by a PECVD method. It has been found that the films prepared under higher flow rate of **C5F8** show higher thermal stability in addition to higher **deposition** rate. These results indicate the importance of controlling secondary reactions by means of adjusting the mean residence time of gas-phase species in the reaction chamber. In situ gas-phase diagnostics using OES and FT-IR were applied for investigating the effects of residence time on **gas**-phase **composition**, and revealed that the long-residence-time

- discharge was no longer **C5F8 plasma** but CF4/C2F6 **plasma**, while the inclusion of CF4/C2F6 in short-residence-time discharge was small.
- CC A8115H Chemical vapour deposition; A6140 Structure of amorphous and polymeric materials; A6855 Thin film growth, structure, and epitaxy; A5275R Plasma applications in manufacturing and materials processing; A5270K Optical (ultraviolet, visible, infrared) plasma diagnostic techniques
- CT AMORPHOUS STATE; CARBON; FLUORINE; **PLASMA CVD**; **PLASMA** DIAGNOSTICS; THERMAL STABILITY; THIN FILMS
- ST low-k films; **plasma CVD**; substitutional fluorocarbon source; amorphous films; flow rate; thermal stability; **deposition rate**; gas-phase diagnostics; **gas-phase composition**; residence time; FTIR spectra; optical emission spectra; C:F
- CHI C:F bin, C bin, F bin, C el, F el, F dop
- ET C*F; C:F; F doping; doped materials; C5F8; C cp; cp; F cp; CF4; C2F6
- L80 ANSWER 6 OF 6 INSPEC (C) 2004 IEE on STN
- AN 1979:1336514 INSPEC DN A79036759
- TI Electron attachment to perfluorocarbon compounds. II. c-**C5F8**, c-C6F10, c-C6F12, C7F8, and C8F16: relevance to gaseous dielectrics.
- AU Pai, R.Y.; Christophorou, L.G.; Christodoulides, A.A. (Health & Safety Res. Div., Oak Ridge Nat. Lab., Oak Ridge, TN, USA)
- SO Journal of Chemical Physics (1 Feb. 1979) vol.70, no.3, p.1169-76. 13 refs.
CODEN: JCPSA6 ISSN: 0021-9606
- DT Journal
- TC Experimental
- CY United States
- LA English
- AB For pt.I see ibid., vol.70, no.3, p.1156 (1979). Electron attachment rates α as a function of the pressure-reduced electric field have been measured for c-**C5F8** (**perfluorocyclopentene**), c-C6F10 (**perfluorocyclohexene**), c-C6F12 (**perfluoro-1,2-dimethylcyclobutane**), C7F8 (**perfluorotoluene**), and C8F16 (**perfluoro-1,3-dimethylcyclohexane**). The thermal values (α) of the attachment rate for these compounds are 12.8, 12.9, 5.0, 9.2, and 2.4×10^9 sec⁻¹ Torr⁻¹, respectively. The electron attachment cross sections σ_a (ϵ) as functions of the electron energy ϵ have been determined using the swarm-unfolding technique; they show distinct structure at $\epsilon < 1.5$ eV. The electron attachment properties for the perfluorocarbons (PFCs) studied in this and in pt.I depend strongly on the molecular structure. Thus (i) open-chain saturated PFCs do not attach electrons as efficiently as the unsaturated PFCs; (ii) for saturated PFCs an increase in molecular size (chain length) increases α ; (iii) the presence of multiple bonds in the molecule dramatically increases the magnitude of α for the saturated open-chain PFCs, but it has only a small effect for cyclic PFCs; (iv) the cyclic nature of the PFCs seems to increase greatly σ_a (ϵ); and (v) for single-bonded cyclic PFCs, substitution of CF3 groups for F atoms increases (α) more than does an increase in molecular size; in double-bonded cyclic compounds increase in ring size increases σ_a (ϵ) at thermal energies. The PFCs studied in this and in pt.I have higher dielectric strengths than SF6. This improvement in dielectric strength can be attributed to their large σ_a (ϵ) over a wider energy range (to approximately 1.5 eV). Their use as unitary gases and/or as additives to multicomponent **gas mixtures** is discussed.
- CC A3470 Charge transfer; A5150 Electrical phenomena in gases

CT ELECTRIC STRENGTH; ELECTRON ATTACHMENT; ORGANIC COMPOUNDS
ST perfluorocarbon compounds; gaseous dielectrics;
perfluorocyclopentene; perfluorocyclohexene; perfluoro-1,2-
dimethylcyclobutane; perfluorotoluene; perfluoro-1,3-dimethylcyclohexane;
electron energy; <1.5 eV; molecular structure; chain length; multiple
bonds; dielectric strength; **multicomponent gas mixtures**;
electron attachment; double bonded cyclic compounds
ET C*F; C5F8; C cp; cp; F cp; C6F10; C6F12; C7F8; C8F16; Cs*F*P; PFCs; P cp;
Cs cp; CF3; F; F*S; SF6; S cp

=> file scisearch, solidstate,ntis

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=> d L79 1-21 all

L79 ANSWER 1 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN
AN 2004:518185 SCISEARCH
GA The Genuine Article (R) Number: 824RK
TI **Plasma** copolymerization of C6F6/**C5F8** for application
of low-dielectric-constant fluorinated amorphous carbon films and its
gas-phase diagnostics using in situ Fourier transform infrared
spectroscopy
AU Shirafuji T (Reprint); Tsuchino A; Nakamura T; Tachibana K
CS Kyoto Univ, Int Innovat Ctr, Sakyo Ku, Kyoto 6068501, Japan (Reprint);
Kyoto Univ, Dept Elect, Sakyo Ku, Kyoto 6068501, Japan
CYA Japan
SO JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES &
REVIEW PAPERS, (MAY 2004) Vol. 43, No. 5A, pp. 2697-2703.
Publisher: INST PURE APPLIED PHYSICS, TOYOKAIJI BLDG NO. 12, 6-9-6
SHINBASHI, MINATO-KU, TOKYO, 105, JAPAN.
ISSN: 0021-4922.
DT Article; Journal
LA English
REC Reference Count: 19
AB Low-dielectric-constant fluorinated amorphous carbon films have been
prepared from a C6F6 and **C5F8 gas mixture** by
an inductively coupled **plasma**-enhanced chemical vapor
deposition method. The films from 100% **C5F8** have
volatile nature, and they are vaporized by heating to 400degreesC. On the
other hand, the films prepared with 100% C6F6 have higher thermal
stability. After the thermal treatment of the **composite** films,
the dielectric constant of the films is reduced to 1.6, although the
residual thickness of the films is not 100%. This result suggests that the
tissue from **C5F8** is vaporized by thermal treatment and voids are
formed in the films. Void concentration in the films is estimated to be
40-60%. The structural change due to the thermal treatment stops after
5-10 min, and no marked structural changes are observed after further

thermal treatment at 400degreesC. The higher thermal stability of the films prepared with C6F6 has been attributed to the incorporation of the aromatic ring structure in the films. The gas-phase diagnostics of the **deposition** processes and the structural analysis of the films have suggested that C6F6 is highly polymerizable and its ring structure can be incorporated in the films.

CC PHYSICS, APPLIED

ST Author Keywords: C6F6; **C5F8**; **plasma**; chemical vapor **deposition**; copolymerization; low dielectric constant; porous; aromatic carbon ring; thermal stability

STP KeyWords Plus (R): THIN-FILMS; **DEPOSITION**; **C5F8**

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
ANON	2003		5	INT TECHNOLOGY ROADM
ASPNES D E	1982	89	249	THIN SOLID FILMS
BAI H	1993	169	317	CHEM PHYS
DAGOSTINO R	1990		CH2	PLASMA DEPOSITION TR
ENDO K	1997	36	L1531	JPN J APPL PHYS 2
GOLUB M A	1992	30	2683	J POLYM SCI POL CHEM
HAN L C M	1998	511	93	MATER RES SOC SYMP P
JAIN A	2001	398	513	THIN SOLID FILMS
LIU P T	2002	414	1	THIN SOLID FILMS
MILELLA A	2002			THESIS U DEGLI STUDI
MILLER R D	1999	565	3	MATER RES SOC SYMP P
SAKATA J	1988	26	1721	J POLYM SCI A
SEKINE M	2002	192	270	APPL SURF SCI
SHIRAFUJI T	2000	15	425	MAT RES SOC C P ULSI
SHIRAFUJI T	2000	374	256	THIN SOLID FILMS
SHIRAFUJI T	1999	38	4520	JPN J APPL PHYS 1
TAKAHASHI K	2000	374	303	THIN SOLID FILMS
UCHIDA Y	2000	39	L1555	JPN J APPL PHYS
URRUTIA M S	1988	42	42	J APPL POLYM SCI APP

L79 ANSWER 2 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2004:399835 SCISEARCH

GA The Genuine Article (R) Number: 811QS

TI Fourier transform infrared phase-modulated ellipsometry for in situ diagnostics of **plasma**-surface interactions

AU Shirafuji T (Reprint); Motomura H; Tachibana K

CS Kyoto Univ, Int Innovat Ctr, Sakyo Ku, Kyoto 6068501, Japan (Reprint); Kyoto Univ, Dept Elect, Nishikyo Ku, Katsura 6158510, Japan

CYA Japan

SO JOURNAL OF PHYSICS D-APPLIED PHYSICS, (21 MAR 2004) Vol. 37, No. 6, pp. R49-R73.

Publisher: IOP PUBLISHING LTD, DIRAC HOUSE, TEMPLE BACK, BRISTOL BS1 6BE, ENGLAND.

ISSN: 0022-3727.

DT General Review; Journal

LA English

REC Reference Count: 78

AB Applicability of Fourier transform infrared (FTIR) spectroscopy to an in situ diagnostics tool of **plasma**-surface interactions is described. After a brief review of conventional reflection absorption spectroscopy (RAS) and phase-modulated RAS (PMRAS), our FTIR phase-modulated spectroscopic ellipsometry (PMSE) is described in detail. The FTIR PMSE is constructed by insertion of a grid polarizer as an

analyser in front of an infrared detector in addition to the conventional set-up of PMRAS. This simple change brings about a higher sensitivity than that of conventional PMRAS, which enables us to detect chemical species generated on (or removed from) the top surface layer during **plasma** processing. This feature is demonstrated by the fact that our FTIR PMSE can be applied to surface diagnostics during reactive ion **etching** processes such as for Si, SiO₂/Si, SiO₂/Si₃N₄, SiO₂/photo-resist and low-dielectric-constant films.

CC PHYSICS, APPLIED

STP KeyWords Plus (R): CHEMICAL-VAPOR-**DEPOSITION**; REFLECTION
ABSORPTION-SPECTROSCOPY; DISCHARGE SILANE **PLASMA**; LOW DIELECTRIC
FILM; FLUOROCARBON **PLASMAS**; RADICAL DENSITIES; **C5F8**
PLASMAS; THIN-FILMS; SELECTIVITY MECHANISM; PROCESSING
PLASMAS

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
ANTHONY B	1989	7	621	J VAC SCI TECHNOL B
AYDIL E S	1993	11	195	J VAC SCI TECHNOL B
AYDIL E S	1994	148	159	MATER SCI FORUM
AYDIL E S	1995	13	258	J VAC SCI TECHNOL B
AZZAM R M A	1999			ELLIPSOMETRY POLARIZ
BERMUDEZ V M	1991	248	201	SURF SCI
BERMUDEZ V M	1992	10	3478	J VAC SCI TECHNOL A
BERMUDEZ V M	1992	10	152	J VAC SCI TECHNOL A
BOHR M T	1995		241	P IEEE INT EL DEV M
BOHR M T	1998	45	620	IEEE T ELECTRON DEV
BORN M	1993			PRINCIPLES OPTICS
CANILLAS A	1993	64	2153	REV SCI INSTRUM
CHABAL Y J	1988	8	211	SURFACE SCI REPT
COLLINS R W	1988		1003	AMORPHOUS SILICON RE
COLTHUP N B	1990			INTRO INFRARED RAMAN
DEN S	1996	35	6528	JPN J APPL PHYS 1
DESCMUKH S C	1995	13	2355	J VAC SCI TECHNOL A
DONNELLY V M	1980	51	5273	J APPL PHYS
DREVILLON B	1988	63	5088	J APPL PHYS
FRACASSI F	1987	62	3980	J APPL PHYS
FRANCIS S A	1959	49	131	J OPT SOC AM
FUJIMURA S	1993	12	91	PHYSICS CHEM SIO2 SI
FUJIMURA S	1993		618	INT C SOL STAT DEV M
GOLUB M A	1992	30	2683	J POLYM SCI POL CHEM
GOTO T	2001	44	99	ADV ATOM MOL OPT PHY
GOTO M	1994	33	3602	JPN J APPL PHYS PT 1
GREENLER R G	1969	50	1963	J CHEM PHYS
GREENLER R G	1966	44	310	J CHEM PHYS
HATTA A	1985	1	403	ANAL SCI
HAVERLAG M	1994	12	3102	J VAC SCI TECHNOL A
HAVEMANN R H	2001	89	586	P IEEE
HORIE M	1995	13	2490	J VAC SCI TECHNOL A
HORI M	2002	192	135	APPL SURF SCI
HSIEH Y F	1991	58	122	APPL PHYS LETT
IMAI S	2002	20	1482	J VAC SCI TECHNOL B
ITABASHI N	1988	27	L1565	JPN J APPL PHYS
JACOX M E	1969	50	3252	J CHEM PHYS
KAWAMURA K	1991	30	3215	JPN J APPL PHYS PT 1
KIKKAWA T	2001	84	26	ELECTRON COMM JPN 2
KROESEN G M W	1998	16	225	J VAC SCI TECHNOL A

LEE H J	1998	37	4522	JPN J APPL PHYS 1
LO C W	1993	47	15648	PHYS REV B
MANTL S	1992	61	267	APPL PHYS LETT
MARUYAMA K	1995	28	884	J PHYS D APPL PHYS
MCGONIGAL M	1990	54	1033	J ELECTRON SPECTROSC
KOLB D M	1971	28	321	SURF SCI
MCINTYRE J D	1971	24	417	SURF SCI
MIYATA K	1996	14	2343	J VAC SCI TECHNOL A
MORIKAWA Y	2001	19	1747	J VAC SCI TECHNOL 2
MOTOMURA H	2003			INT UNION PURE APPL
MOTOMURA H	2001	390	134	THIN SOLID FILMS
MOTOMURA H	2000	374	243	THIN SOLID FILMS
NAFIE L A	1982		CH3	FOURIER TRANSFORM IN
NAGAI H	2003	42	L212	JPN J APPL PHYS 2
NAGAI H	2003	94	1362	J APPL PHYS
NAGAI H	2002	91	2615	J APPL PHYS
NAKAMOTO K	1986		CH2	INFRARED RAMAN SPECT
NISHIDA M	1994	79	409	APPL SURF SCI
OEHRLEIN G S	1987	62	662	J APPL PHYS
SCHAEPKENS M	1999	17	26	J VAC SCI TECHNOL A
SHIRAFUJI T	1997	15	209	J VAC SCI TECHNOL A
SHIRAFUJI T	1996	35	2047	JPN J APPL PHYS 1
SMITH G C	1994			SURFACE ANAL ELECT S
TACHIBANA K	1992	31	2588	JPN J APPL PHYS PT 1
TACHIBANA K	2002	11	A166	PLASMA SOURCES SCI T
TACHIBANA K	1994	33	4191	JPN J APPL PHYS 1
TACHIBANA K	1991	30	L1208	JPN J APPL PHYS PT 2
TACHIBANA K	1993	17	68	MAT SCI ENG B-SOLID
TACHIBANA E	1996	35	3652	JPN J APPL PHYS 1
TACHIBANA K	1999	74	2390	APPL PHYS LETT
TAKAHASHI K	2000	374	303	THIN SOLID FILMS
TAKAHASHI K	1993	32	L694	JPN J APPL PHYS PT 2
TANAKA N	2002	92	5684	J APPL PHYS
VICKERMAN J C	1997			SURFACE ANAL PRINCIP
WADAYAMA T	1988	27	50	JPN J APPL PHYS
WADAYAMA T	1989	218	L490	SURF SCI
WANG Z L	1996			REFLECTION ELECT MIC
WINTERS H F	1992	14	161	SURF SCI REP

L79 ANSWER 3 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2004:7805 SCISEARCH

GA The Genuine Article (R) Number: 753AW

TI Predictable topography simulation of SiO₂ **etching** by
C5F8 gas combined with a **plasma** simulation, sheath model
and chemical reaction model

AU Takagi S (Reprint); Onoue S; Iyanagi K; Nishitani K; Shinmura T; Kanoh M;
Itoh H; Shioyama Y; Akiyama T; Kishigami D

CS Toshiba Co Ltd, Corp Mfg Engn Ctr, Isogo Ku, 33 Shin Isogo Cho, Kanagawa,
Japan (Reprint); Toshiba Co Ltd, Corp Mfg Engn Ctr, Isogo Ku, Kanagawa,
Japan; Toshiba Co Ltd, Semicond Co, Proc & Mfg Engn Ctr, Adv ULSI Proc
Engn Dept 3, Adv Proc Engn Grp 1, Iso, Yokohama, Kanagawa, Japan; Toshiba
Co Ltd, Semicond Co, Syst LSI Div, Adv Log Technol Dept, Adv Log Prod Dev
Grp, Oita, Japan

CYA Japan

SO PLASMA SOURCES SCIENCE & TECHNOLOGY, (NOV 2003) Vol. 12, No. 4, pp.
S64-S71.

Publisher: IOP PUBLISHING LTD, DIRAC HOUSE, TEMPLE BACK, BRISTOL BS1 6BE,
ENGLAND.

ISSN: 0963-0252.

DT Article; Journal

LA English

REC Reference Count: 23

AB We have developed a simulation for predicting reactive ion **etching** (RIE) topography, which is a combination of **plasma** simulation, the gas reaction model, the sheath model and the surface reaction model. The simulation is applied to the SiO₂ **etching** process of a high-aspect-ratio contact hole using **C5F8** gas. A capacitively coupled **plasma** (CCP) reactor of an 8-in. wafer was used in the **etching** experiments. The baseline conditions are RF power of 1500 W and gas pressure of 4.0 Pa in a **gas mixture** of Ar, O₂ and **C5F8**. The **plasma** simulation reproduces the tendency that CF₂ radical density increases rapidly and the electron density decreases gradually with increasing gas flow rate of **C5F8**. In the RIE topography simulation, the **etching** profiles such as bowing and taper shape at the bottom are reproduced in deep holes with aspect ratios greater than 19. Moreover, the **etching** profile, the dependence of the **etch** depth on the **etching** time, and the bottom diameter can be predicted by this simulation.

CC PHYSICS, FLUIDS & PLASMAS

STP KeyWords Plus (R): PROFILE EVOLUTION; SURFACE-REACTIONS; DENSITY; C2F6

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
BIRDSALL C K	1991	19	65	IEEE T PLASMA SCI
HAMAGUCHI S	1994	12	2745	J VAC SCI TECHNOL A
HAN J S	1995	13	1893	J VAC SCI TECHNOL B
HO P	2001	19	2344	J VAC SCI TECHNOL A
IYANAGI S	2002		108	60 AUT M 1999 JAP SO
KISS L D B	1992	71	3186	J APPL PHYS
KOKURA H	1999	38	5262	JPN J APPL PHYS 1
LIEBERMAN M A	1994		255	PRINCIPLES PLASMA DI
MATSUI H	2002			49 SPRING M 2002 JAP
MEEKER L D	2001	16	544	PALEOCEANOGRAPHY
NAKAMURA Y	1988	21	718	J PHYS D
NAKAMURA S	2000		199	P S DRY PROC TOK
NEGISHI N	2000		31	P S DRY PROC
ONOE S	2000		254	EUR C AT MOL PHYS IO
SINGH V K	1992	10	1091	J VAC SCI TECHNOL B
SUGAI H	1992	10	1193	J VAC SCI TECHNOL A
TAKAGI S	2002	41	3947	JPN J APPL PHYS 1
TAKAGI S	2001	121	414	T IEE JPN A
TATSUMI T	2000		37	P 22 S DRY PROC
TATSUMI T	2000	18	1897	J VAC SCI TECHNOL B
TATSUMI T	1999	17	1562	J VAC SCI TECHNOL 1
TUDA M	1996	14	3291	J VAC SCI TECHNOL B
ZHANG D	2001	19	524	J VAC SCI TECHNOL A

L79 ANSWER 4 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2003:942423 SCISEARCH

GA The Genuine Article (R) Number: 734HM

TI **Etching** of Si, SiO₂, and Si₃N₄ in fluorocarbon discharges
interpretation based on a Langmuir surface kinetics model

AU Kim M T (Reprint)

CS Korea Elect Power Res Inst, Ctr Adv Technol, Taejon 305380, South Korea

(Reprint)

CYA South Korea

SO JOURNAL OF THE ELECTROCHEMICAL SOCIETY, (NOV 2003) Vol. 150, No. 11, pp. G683-G688.

Publisher: ELECTROCHEMICAL SOC INC, 65 SOUTH MAIN STREET, PENNINGTON, NJ 08534 USA.

ISSN: 0013-4651.

DT Article; Journal

LA English

REC Reference Count: 21

AB **Deposition/etching** rates of fluorocarbon films

measured as a function of the bias-voltage applied to the substrate in fluorocarbon discharges of an inductively coupled **plasma** reactor are analytically interpreted using a modified Langmuir surface kinetics model. The data for various fluorocarbon discharges given in the literature are well described by the modified surface kinetics model. Plotting (**etch** rate + **deposition** rate at zero ion flux) (-1) as a function of (**plasma** potential 2 bias voltage) (-3/2) yield a straight line, as expected, giving the value of the pure chemical **etch** rate and the relative value of sputter yield by incident ions. Based on this interpretation, **etching** behaviors of SiO₂, Si₃N₄, and Si in fluorocarbon discharges are approached and thereby the selective **etching** of SiO₂ over other materials is discussed. (C) 2003 The Electrochemical Society.

CC ELECTROCHEMISTRY; MATERIALS SCIENCE, COATINGS & FILMS

STP KeyWords Plus (R): SELECTIVITY MECHANISM; RADICAL DENSITIES; SILICON DIOXIDE; **C5F8 PLASMAS**; CF₄ **PLASMAS**; F-ATOMS; SiO₂; **DEPOSITION**; PRESSURE; GASES

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
BELL F H	1994	12	3095	J VAC SCI TECHNOL A
DING J	1996	68	1619	APPL PHYS LETT
ENTLEY W R	2000	3	99	ELECTROCHEM SOLID ST
GOEKNER M J	1999	17	2586	J VAC SCI TECHNOL A
HEINECKE R A H	1975	18	1146	SOLID STATE ELECTRON
IMAI S	2002	20	1482	J VAC SCI TECHNOL B
KIM M T	2003	150	F33	J ELECTROCHEM SOC
KIM M T	2002	149	G218	J ELECTROCHEM SOC
LAGARDE T	1999	17	118	J VAC SCI TECHNOL B
LEE J W	1999	43	1769	SOLID STATE ELECTRON
MIYATA K	1997	15	568	J VAC SCI TECHNOL 1
MOTOMURA H	2000	374	243	THIN SOLID FILMS
RUEGER N R	1997	15	1881	J VAC SCI TECHNOL A
SASAKI K	1999	70	76	REV SCI INSTRUM 1
SASAKI K	1999	38	L954	JPN J APPL PHYS 2
SCHAEPKENS M	1999	17	26	J VAC SCI TECHNOL A
SCHAEPKENS M	2001	148	C211	J ELECTROCHEM SOC
TACHIBANA K	1999	38	4367	JPN J APPL PHYS 1
TAGO K	1998	279	60	J ALLOY COMPD
TAKAHASHI K	2000	374	303	THIN SOLID FILMS
USUI K	1999	38	4373	JPN J APPL PHYS 1

L79 ANSWER 5 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2003:862761 SCISEARCH

GA The Genuine Article (R) Number: 725WL

TI Comparative studies of perfluorocarbon alternative gas **plasmas**

for contact hole **etch**

AU Nakamura S (Reprint); Itano M; Aoyama H; Shibahara K; Yokoyama S; Hirose M
CS DAIKIN Ind Ltd, Div Chem, 1-1 Nishi Hitotsuya, Osaka 5668585, Japan
(Reprint); DAIKIN Ind Ltd, Div Chem, Osaka 5668585, Japan; Hiroshima Univ,
Res Ctr Nanodevices & Syst, Higashihiroshima, Hiroshima 7398527, Japan;
Natl Inst Adv Ind Sci & Technol, Adv Semicond Res Ctr, Tsukuba, Ibaraki
3058562, Japan

CYA Japan

SO JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES &
REVIEW PAPERS, (SEP 2003) Vol. 42, No. 9A, pp. 5759-5764.

Publisher: INST PURE APPLIED PHYSICS, TOYOKAIJI BLDG NO. 12, 6-9-6
SHINBASHI, MINATO-KU, TOKYO, 105, JAPAN.
ISSN: 0021-4922.

DT Article; Journal

LA English

REC Reference Count: 6

AB Saturated perfluorocarbons (PFCs) such as CF₄, C₂F₆, C₃F₈ and c-C₄F₈
are used as dry-**etch** gases in the semiconductor industry. They
have a significant greenhouse effect. Unsaturated fluorocarbons can be
alternated with these PFCs because of their easy decomposition in the
atmosphere. The authors have diagnosed the **plasmas** generated
from straight-chain unsaturated gases such as C₃F₆, C₄F₆, C₄F₈ and
C5F8 in an inductively coupled **plasma** reactor and have
compared their **etch** properties. It was found that high
selectivity has been obtained in a C₄F₆ or **C5F8 plasma**
without mixing any specific gases. Fine contact holes of approximately 100
nm in diameter also have been obtained Using C₄F₆ or **C5F8** with
or without adding Ar or O-2. These good **etch** properties Of C₄F₆
and **C5F8** have been achieved as a consequence of the appropriate
balance between the lower density of fluorocarbon polymers and the
dominant **etching** species CF⁺ with lower **etching**
efficiency. It can be concluded that C₄F₆ and **C5F8** can be used
as PFC replacements for the dry-**etch** gas.

CC PHYSICS, APPLIED

ST Author Keywords: greenhouse effect; PFC alternative gas; straight-chain
unsaturated fluorocarbon; inductively coupled **plasma** (ICP); SiO₂
etching; contact hole **etch**

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
ANON	1997		1	SEMI 1997 PFC FOR
*INT PAN CLIM CHAN	2001		3894	CLIM CHANG 2001 SCI
HIKOSAKA Y	1993	32	353	JPN J APPL PHYS
IMASU R	1995	73	1123	J METEOROL SOC JPN
MATSUSHITA Y	2000	69	305	OYO BUTURI
MUKAI T	1999		39	P S DRY PROC TOK

L79 ANSWER 6 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2003:717235 SCISEARCH

GA The Genuine Article (R) Number: 710BY

TI **Plasma** enhanced chemical vapor **deposition** of
fluorinated amorphous carbon films on the surface with reverse tapered
microstructures

AU Shirafuji T (Reprint); Wada T; Kashiwagi M; Nakamura T; Tachibana K
CS Kyoto Univ, Dept Elect, Sakyo Ku, Kyoto 6068501, Japan (Reprint); Kyoto
Univ, Int Innovat Ctr, Sakyo Ku, Kyoto 6068501, Japan; Zeon Corp, Kawasaki
Ku, Kawasaki, Kanagawa 2019507, Japan

CYA Japan

SO JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES & REVIEW PAPERS, (JUL 2003) Vol. 42, No. 7A, pp. 4504-4509.

Publisher: INST PURE APPLIED PHYSICS, DAINI TOYOKAIJI BLDG, 4-24-8 SHINBASHI, MINATO-KU TOKYO, 105-004, JAPAN.

ISSN: 0021-4922.

DT Article; Journal

LA English

REC Reference Count: 24

AB Fluorinated amorphous carbon films have been **deposited** using a novel monomer of **C5F8** with a quite high **deposition** rate of 500 nm/min at room temperature. The capability of **deposition** on the surface with reverse tapered microstructures, which are formed for micro patterning of organic electroluminescence, devices, has been demonstrated. The unique **deposition** profile is discussed in terms of the nature of **deposition** precursors which are mainly estimated from the results of in situ Fourier transform infrared spectroscopy and optical emission spectroscopy of the gas phase.

CC PHYSICS, APPLIED

ST Author Keywords: **C5F8**; **plasma**; chemical vapor **deposition**; organic electroluminescence; passivation; diagnosticsSTP KeyWords Plus (R): GAS-PHASE; SILICON; DEVICE; KINETICS; GROWTH; **C5F8**

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
=====	=====	=====	=====	=====
AZIZ H	1998	72	2642	APPL PHYS LETT
DAGOSTINO R	1990		CH2	PLASMA DEPOSITION TR
FRACASSI F	1987	62	3980	J APPL PHYS
FUNG M K	2001	333	432	CHEM PHYS LETT
GAO D W	1999	38	4868	JPN J APPL PHYS 1
HORI M	1999	75	813	J PLASMA FUS RES
HORI M	2002	192	135	APPL SURF SCI
LABELLE C B	2000	6	27	CHEM VAPOR DEPOS
MATSUDA A	1986	60	2351	J APPL PHYS
MILELLA A	2002		CH5	THESIS U DEGLI STUDI
NAGAYAMA K	1997	36	L1555	JPN J APPL PHYS 2
NAKAMOTO K	1986		378	INFRARED RAMAN SPECT
NAKANO T	1999	17	686	J VAC SCI TECHNOL A
SEKINE M	2002	192	270	APPL SURF SCI
SHIRAFUJI T	2000	374	256	THIN SOLID FILMS
SHIRAFUJI T	1999	38	4520	JPN J APPL PHYS 1
SHIRAFUJI T	1999	4	57	PLASMAS POLYM
SHIRAFUJI T	2000	15	425	MAT RES SOC C P ULSI
SOSA C	1984	106	5847	J AM CHEM SOC
TAKAHASHI K	1996	35	3635	JPN J APPL PHYS 1
TAKAHASHI K	2000	374	303	THIN SOLID FILMS
TANG C W	1987	51	913	APPL PHYS LETT
TSAI C C	1986	59	2998	J APPL PHYS
YUUKI A	1989	28	212	JPN J APPL PHYS PT 1

L79 ANSWER 7 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2003:489708 SCISEARCH

GA The Genuine Article (R) Number: 685VE

TI A new microwave-excited **plasma etching** equipment for separating **plasma** excited region from **etching** process region

AU Goto T (Reprint); Hirayama M; Yamauchi H; Moriguchi M; Sugawa S; Ohmi T
 CS Tohoku Univ, New Ind Creat Hatchery Ctr, Sendai, Miyagi 9808579, Japan
 (Reprint); Tohoku Univ, Grad Sch Engr, Sendai, Miyagi 9808579, Japan
 CYA Japan
 SO JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES &
 REVIEW PAPERS, (APR 2003) Vol. 42, No. 4B, pp. 1887-1891.
 Publisher: INST PURE APPLIED PHYSICS, DAINI TOYOKAIJI BLDG, 4-24-8
 SHINBASHI, MINATO-KU TOKYO, 105-004, JAPAN.
 ISSN: 0021-4922.
 DT Article; Journal
 LA English
 REC Reference Count: 8
 AB A new microwave-excited **plasma etching** equipment
 has been developed. The equipment adopts a low-electron temperature and
 high-density **plasma** source using a radial line slot antenna and
 a newly developed metal shower head for **etching** gas supply into
 the low-electron temperature diffusion **plasma** region in order to
 control the decomposition of gasses. Ion flux and ion energy to a wafer
 can be individually controlled by adjusting the microwave power applied to
 the antenna and the rf power applied to the wafer stage. Contact holes of
 100 nm wide in SiO2 were successfully **etched** using **C5F8**
 . **Etching** selectivity to the resist was improved by introducing
C5F8 into the **etching** process region using the gas
 shower head, which indicates that excess decomposition Of **C5F8**
 is suppressed.
 CC PHYSICS, APPLIED
 ST Author Keywords: reactive ion **etching**; microwave-excited
plasma; RLSA; shower head; excess decomposition; SiO2
etching
 STP KeyWords Plus (R): DENSITY
 RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
CHAPMAN B	1980		CH5	GLOW DISCHARGE PROCE
HIRAYAMA M	1999		249	IEDM
HIRAYAMA M	1997		CH4	THESIS TOHOKU U
KAIHARA R	2000		102	P 9 INT S SEM MAN
SAITO Y	2000		176	S VLSI TECHN
SEKINE K	2001	48	1550	IEEE T ELECTRON DEV
SEKINE M	1995	34	6274	JPN J APPL PHYS 1
SUGAWA S	2001			INT EL DEV M

L79 ANSWER 8 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN
 AN 2003:181452 SCISEARCH
 GA The Genuine Article (R) Number: 647LE
 TI Kinetics of **deposition** in fluorocarbon discharges interpretation
 based on an analytical **plasma** chemistry model
 AU Kim M T (Reprint)
 CS Korea Elect Power Res Inst, Mat & Machinery Grp, Taejon 305380, South
 Korea (Reprint)
 CYA South Korea
 SO JOURNAL OF THE ELECTROCHEMICAL SOCIETY, (MAR 2003) Vol. 150, No. 3, pp.
 F33-F41.
 Publisher: ELECTROCHEMICAL SOC INC, 65 SOUTH MAIN STREET, PENNINGTON, NJ
 08534 USA.
 ISSN: 0013-4651.
 DT Article; Journal

LA English

REC Reference Count: 35

AB An analytical **plasma** chemistry model developed in our previous work was adopted for the interpretation of polymer **deposition** in fluorocarbon discharges. The rate of **deposition** of polymer films was expressed in terms of the three **plasma** variables (discharge power, flow rate of feed gas, and pressure). If the film precursors are generated directly from feed gas molecules in the **plasma**, the model predicts that the inverse **deposition** rate is linearly proportional to the inverse discharge power and, at enough low flow rates of feed gas, in the inverse flow rate. Some data in the literature followed this prediction fairly well, which allowed some **plasma** parameters such as the dissociation efficiency to be estimated. It is also expected that the pressure divided by the **deposition** rate is linearly proportional to the pressure squared. This expectation agreed well with data in the literature for several fluorocarbon discharges. From the line fit of the plotting (pressure/**deposition** rate vs. pressure squared) the relative yields of film precursors and **etchants** dissociated from a fluorocarbon molecule in the **plasma** were estimated. The **etch** behavior in fluorocarbon discharges can be approached in terms of these yields. (C) 2003 The Electrochemical Society.

CC ELECTROCHEMISTRY; MATERIALS SCIENCE, COATINGS & FILMS

STP KeyWords Plus (R): ULTRAVIOLET-ABSORPTION-SPECTROSCOPY; HIGH-DENSITY; SILICON DIOXIDE; F-ATOMS; **C5F8 PLASMAS**; LOW-PRESSURE; CF4 **PLASMA**; SiO2; RADICALS; REACTOR

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
BELL F H	1994	12	3095	J VAC SCI TECHNOL A
BONHAM R A	1994	33	4157	JPN J APPL PHYS 1
BOOTH J P	1999	8	249	PLASMA SOURCES SCI T
CHOW T P	1984	131	156	J ELECTROCHEM SOC
DING J	1996	68	1619	APPL PHYS LETT
ECONOMOU D J	2000	365	348	THIN SOLID FILMS
ENTLEY W R	2000	3	99	ELECTROCHEM SOLID ST
GOEKNER M J	1999	17	2586	J VAC SCI TECHNOL A
HAVERLAG M	1994	12	3102	J VAC SCI TECHNOL A
HEBNER G A	2001	89	900	J APPL PHYS
KIM M T	1999	347	99	THIN SOLID FILMS
KIM M T	2000	360	60	THIN SOLID FILMS
KIM M T	2000	147	1204	J ELECTROCHEM SOC
KIM M T	2002	149	G218	J ELECTROCHEM SOC
KIM M T	2001	401	39	THIN SOLID FILMS
MEEKS E	2000	365	334	THIN SOLID FILMS
MOTOMURA H	2000	374	243	THIN SOLID FILMS
ONEILL J A	1994	76	5967	J APPL PHYS
RUEGER N R	1999	17	2492	J VAC SCI TECHNOL A
SASAKI K	1999	70	76	REV SCI INSTRUM 1
SASAKI K	1999	38	954	JPN J APPL PHYS PT 1
SCHAEPKENS M	2001	19	2946	J VAC SCI TECHNOL A
SCHAEPKENS M	1999	17	26	J VAC SCI TECHNOL A
SCHAEPKENS M	2001	148	C211	J ELECTROCHEM SOC
SCHMITT J P M	1991	219	631	MATER RES SOC S P
SMOLINSKY G	1979	50	4982	J APPL PHYS
SOWA M J	2000	18	2122	J VAC SCI TECHNOL A
SUZUKI C	1998	16	2222	J VAC SCI TECHNOL A

TACHIBANA K	1999 38	4367	JPN J APPL PHYS 1
TAGO K	1998 279	60	J ALLOY COMPD
TAKAHASHI K	2000 374	303	THIN SOLID FILMS
TAKAHASHI K	1994 33	4745	JPN J APPL PHYS 1
TSEREPI A	1997 15	3120	J VAC SCI TECHNOL A
USUI K	1999 38	4373	JPN J APPL PHYS 1
ZHANG D	2000 87	1060	J APPL PHYS

L79 ANSWER 9 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2002:711822 SCISEARCH

GA The Genuine Article (R) Number: 585ED

TI Photoresist selectivity mechanism in SiO₂ **etching** by inductively coupled **plasma** using fluorocarbon gases

AU Imai S (Reprint); Motomura H; Tachibana K

CS Semicond Co, Mfg Technol Ctr, Matsushita Elect Ind, 271 Higashi Kaihotsu, Toyama 9391312, Japan (Reprint); Semicond Co, Mfg Technol Ctr, Matsushita Elect Ind, Toyama 9391312, Japan; Kyoto Univ, Dept Elect Sci & Engr, Sakyo Ku, Kyoto 6068501, Japan

CYA Japan

SO JOURNAL OF VACUUM SCIENCE & TECHNOLOGY B, (JUL-AUG 2002) Vol. 20, No. 4, pp. 1482-1488.

Publisher: A V S AMER INST PHYSICS, STE 1 NO 1, 2 HUNTINGTON QUADRANGLE,, MELVILLE, NY 11747-4502 USA.

ISSN: 1071-1023.

DT Article; Journal

LA English

REC Reference Count: 15

AB The generation of large molecular species in an inductively coupled **plasma** using fluorocarbon gases was investigated to elucidate the selective **etching** mechanism of SiO₂ to photoresist. In this study, the source gases C₂F₆, C₄F₈, and **C₅F₈** were used to provide a range of fluorine-to-carbon content ratios. It was found that larger quantities and a wider variety of large-mass species are generated in **C₅F₈ plasma** than in C₂F₆ and C₄F₈ **plasmas**. Our results also revealed that the gas residence time was an important parameter for controlling the radical **composition** of the **plasma**. With increased residence time, the ratio of species with larger masses than the parent molecule to the sum of all product species increased in the C₂F₆ **plasma**, whereas this ratio decreased in the C₄F₈ and **C₅F₈ plasmas**. The ratio of larger mass species correlates apparently with the selectivity of SiO₂ to photoresist **etch** rates. However, in any explanation of physical mechanisms, the redeposition of **etching** byproducts should be taken into account as well as the dependence of polymer **deposition** tendency on substrate materials under biased **etching** conditions. (C) 2002 American Vacuum Society.

CC ENGINEERING, ELECTRICAL & ELECTRONIC; PHYSICS, APPLIED

STP KeyWords Plus (R): ATTACHMENT MASS-SPECTROSCOPY; SURFACE-REACTION PROCESSES; ELECTRON-ATTACHMENT; **C₅F₈ PLASMAS**; POLYMERIZATION; DISCHARGES; SI₃N₄; C₄F₈

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
CUNGE G	1999 85	3952	J APPL PHYS 1	
DAGOSTINO R	1983 54	1284	J APPL PHYS	
IMAI S	1998 81	899	T ELECT INFO COMMU J	
IMAI S	1996	159	P 18 S DRY PROC	

IMAI S	1999	38	L888	JPN J APPL PHYS 2
KARECKI S	1997		1	P SEMICON SW 97 AUST
MCNEVIN S C	1998	16	1514	J VAC SCI TECHNOL 2
MOTOMURA H	2000	374	243	THIN SOLID FILMS
MOTOMURA H	2001	390	134	THIN SOLID FILMS
NAKAMURA T	2001	40	847	JPN J APPL PHYS 1
SCHAEPKENS M	1999	17	26	J VAC SCI TECHNOL A
SCHAEPKENS M	1998	16	3281	J VAC SCI TECHNOL A
SPYROU S M	1983	78	7200	J CHEM PHYS
STOFFELS E	1998	69	116	REV SCI INSTRUM
STOFFELS W W	1998	16	87	J VAC SCI TECHNOL A

L79 ANSWER 10 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2002:431179 SCISEARCH

GA The Genuine Article (R) Number: 553ZV

TI Ab initio calculations of the dissociative attachment resonance energies for an **octafluorocyclopentene** molecule with comparisons to electron attachment mass spectrometric measurements

AU Nakamura T (Reprint); Tachibana K

CS Kyoto Univ, Dept Elect Sci & Engrn, Kyoto 6068501, Japan (Reprint)

CYA Japan

SO APPLIED PHYSICS LETTERS, (27 MAY 2002) Vol. 80, No. 21, pp. 3904-3906.

Publisher: AMER INST PHYSICS, CIRCULATION & FULFILLMENT DIV, 2 HUNTINGTON QUADRANGLE, STE 1 N O 1, MELVILLE, NY 11747-4501 USA.

ISSN: 0003-6951.

DT Article; Journal

LA English

REC Reference Count: 14

AB Dissociative electron attachment to an **octafluorocyclopentene** (c-**C5F8**) molecule has been investigated by means of ab initio molecular orbital calculations. Because of the antibonding character of the virtual valence orbitals, the temporary anions dissociate, producing neutral and negative radical fragments in reactive **plasma**. In order to identify the valence of virtual orbitals associated with the dissociative electron attachment in the calculation with the diffuse basis set, we examined the spatial distribution and antibonding characteristics of the virtual molecular orbitals. This theoretical approach reproduced experimental resonance energies of the dissociative electron attachment, which display rich resonance energy spectra as observed by electron attachment mass spectrometry. (C) 2002 American Institute of Physics.

CC PHYSICS, APPLIED

STP KeyWords Plus (R): TEMPORARY ANION STATES; **C5F8 PLASMAS**; SPECTROSCOPY; AFFINITIES; **DEPOSITION**; C4F8

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
AFLATOONI K	2000	104	7359	J PHYS CHEM A
FALCETTA M F	1990	94	5666	J PHYS CHEM-US
FENZLAFF M	1986	136	443	CHEM PHYS LETT
FRISCH M J	1998			GAUSSIAN 98 REVISION
GUERRA M	1990	167	315	CHEM PHYS LETT
HEINRICH N	1986	124	20	CHEM PHYS LETT
IMAI S	1999	38	L888	JPN J APPL PHYS 2
MODELLI A	2001	105	5386	J PHYS CHEM A
MOTOMURA H	2000	374	273	THIN SOLID FILMS
MOTOMURA H	2001	390	134	THIN SOLID FILMS
NAKAMURA T	2001	40	847	JPN J APPL PHYS 1

STOFFELS E |1998 |69 |116 |REV SCI INSTRUM
 STOFFELS W W |1998 |16 |87 |J VAC SCI TECHNOL A
 TAKAHASHI K |2000 |374 |303 |THIN SOLID FILMS

L79 ANSWER 11 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN
 AN 2002:261429 SCISEARCH
 GA The Genuine Article (R) Number: 532XE
 TI The use of unsaturated fluorocarbons for dielectric **etch** applications
 AU Chatterjee R (Reprint); Karecki S; Reif R; Vartanian V; Sparks T
 CS MIT, Microsyst Technol Labs, Cambridge, MA 02139 USA (Reprint); Motorola Inc, DigitalDNA Labs, Austin, TX 78721 USA
 CYA USA
 SO JOURNAL OF THE ELECTROCHEMICAL SOCIETY, (APR 2002) Vol. 149, No. 4, pp. G276-G285.
 Publisher: ELECTROCHEMICAL SOC INC, 65 SOUTH MAIN STREET, PENNINGTON, NJ 08534 USA.
 ISSN: 0013-4651.
 DT Article; Journal
 LA English
 REC Reference Count: 17
 AB Six unsaturated fluorocarbon (UFC) gases as well as a fluorinated ether were examined for dielectric **etch** and global warming emissions performance and compared to three perfluorocompound (PFC) gases. All of the gases were capable of **etch** performance comparable to that of a typical C3F8 process, while exhibiting superior global warming emissions performance compared to the PFCs. A low-flow hexafluoro-2-butyne process was found to have a significant emissions benefit, showing a normalized emissions reduction of 88.2% compared to the C3F8 process. Two other C4F6 isomers (h)exafluoro-1,3-butadiene and hexafluorocyclobutene! also exhibited reductions greater than 80%, while hexafluoropropene and **octafluorocyclopentene** exhibited emissions reductions greater than 70% compared to the typical C3F8 process. For the C4F6 isomers, a large portion of the emissions were a result of CHF3 formation with photoresist as the sole source of the hydrogen. An extended 4 min **etch** with hexafluoro-1,3-butadiene resulted in a deep via with an aspect ratio of 5:1, very high selectivity to photoresist, and no evidence of **etch** stopping. (C) 2002 The Electrochemical Society.
 CC ELECTROCHEMISTRY; MATERIALS SCIENCE, COATINGS & FILMS
 STP KeyWords Plus (R): RADICAL-CONTROL METHOD; TRIFLUOROACETIC-ANHYDRIDE; GAS CHEMISTRIES; **PLASMA**; REDUCTION

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
*WORLD MET ORG GLO	1998	2		SCI ASS OZ DEPL 1998
BALDWIN S K	1999	9930	55	ELECTROCHEMICAL SOC
BEU L	1999	99	1	ELEC SOC S
CHATTERJEE R	1999	9930	251	ELECTROCHEMICAL SOC
FRACASSI F	1998	16	1867	J VAC SCI TECHNOL B
ILLUZZI F	1999			P 6 ANN INT SEM ENV
JIMBO S	1999			P 6 ANN INT SEM ENV
KARECKI S	1998	145	4305	J ELECTROCHEM SOC
KARECKI S M	1997	447	67	MAT RES S C
KARECKI S	1996			P 1996 SRC TECHN C S
MOHINDRA V	1994	9420	300	ELECTROCHEMICAL SOC
PRUETTE L C	1998	16	1577	J VAC SCI TECHNOL 2
PRUETTE L C	1998	985	58	ELECTROCHEMICAL SOC

PRUETTE L |1999 |998 |20 |ELECTROCHEMICAL SOC
 SAMUKAWA S |1999 |17 |2463 |J VAC SCI TECHNOL A
 SAMUKAWA S |1999 |17 |2551 |J VAC SCI TECHNOL A
 SAMUKAWA S |1998 |37 |L1095 |JPN J APPL PHYS 2

L79 ANSWER 12 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2001:872488 SCISEARCH

GA The Genuine Article (R) Number: 486ED

TI Process characterization for tapered contact **etch**

AU Celii F G (Reprint); He Q; Liu H Y; DeBord J R; Sakima H

CS Texas Instruments Inc, M-S 3700, Box 650311, Dallas, TX 75265 USA
 (Reprint); Texas Instruments Inc, Dallas, TX 75265 USA; Tokyo Electron
 Amer, Richardson, TX 75080 USA

CYA USA

SO JOURNAL OF VACUUM SCIENCE & TECHNOLOGY B, (SEP-OCT 2001) Vol. 19, No. 5,
 pp. 1845-1851.

Publisher: AMER INST PHYSICS, CIRCULATION & FULFILLMENT DIV, 2 HUNTINGTON
 QUADRANGLE, STE 1 N O 1, MELVILLE, NY 11747-4501 USA.

ISSN: 1071-1023.

DT Article; Journal

LA English

REC Reference Count: 7

AB We report the characterization of contact **etch** processes
 which give variable sidewall taper angles. Patterning at 248 nm gave
 contact holes at similar to 0.19 μm diameter in photoresist over organic
 bottom anti reflection coating (BARC). The contact stack and test
 structures (BARC/oxide/SiN, 5-10 k Angstrom total stack thickness) were
etched in a medium-density TEL dipole ring magnetron (DRM) system.
 Bottom hole diameters ranging from 0.17 down to 0.10 μm could be obtained
 by varying the oxide **etch** process, which included C4F8 or
C5F8 O-2, and Ar. A moderate **etch** selectivity of similar
 to 8:1 (oxide: SiN **etch** rate ratio) was determined for the main
 taper process. **Etched** patterned wafers were characterized using
 top-down critical dimension scanning electron microscopy (CD-SEM),
 cross-section SEM, and transmission electron microscopy. Ex situ surface
 analysis of **etched** blanket wafers using x-ray photoelectron
 spectroscopy showed only small dependence of the surface fluorocarbon film
 thickness and **composition** on taper **etch** process
 conditions. W-filled tapered contacts showed significant improvement in
 contact-gate misalignment margin and in static random access memory (SRAM)
 yield compared to more straight-sidewall contacts. (C) 2001 American
 Vacuum Society.

CC ENGINEERING, ELECTRICAL & ELECTRONIC; PHYSICS, APPLIED

STP KeyWords Plus (R): **PLASMAS**

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
DEJULE R	1998	21	178	SEMICOND INT
MATSUI M				UNPUB J VAC SCI TECH
OEHRLEIN G S	1994	12	323	J VAC SCI TECHNOL A
OEHRLEIN G S	1997	386	222	SURF SCI
OHIWA T	1992	31	405	JPN J APPL PHYS PT 1
PETERS L J	1999	22	68	SEMICOND INT
TATSUMI T	2000	18	1897	J VAC SCI TECHNOL B

L79 ANSWER 13 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2001:553113 SCISEARCH

GA The Genuine Article (R) Number: 447WU
 TI Surface reaction processes in C4F8 and **C5F8 plasmas**
 for selective **etching** of SiO2 over photo-resist
 AU Motomura H; Imai S; Tachibana K (Reprint)
 CS Kyoto Univ, Dept Elect Sci & Engrn, Sakyo Ku, Kyoto 6068501, Japan
 (Reprint); Matsushita Elect Corp, ULSI Proc Technol Dev Ctr, Minami Ku,
 Kyoto 6018413, Japan
 CYA Japan
 SO THIN SOLID FILMS, (30 JUN 2001) Vol. 390, No. 1-2, pp. 134-138.
 Publisher: ELSEVIER SCIENCE SA, PO BOX 564, 1001 LAUSANNE, SWITZERLAND.
 ISSN: 0040-6090.
 DT Article; Journal
 LA English
 REC Reference Count: 13
 AB Surface reactions induced by fluorocarbon **plasmas** were
 studied on Si substrates with SiO2 and photo-resist overlayers using an
 inductively coupled **plasma** source, As source gases, C4F8 and
C5F8 were employed to investigate their differences in the
etching performance and the selectivity between SiO2 and
 photo-resist. **Deposition** of fluorocarbon polymer was noticed in
 both gases by Fourier-transform infrared ellipsometric measurements when
 substrate bias was not applied. With the bias application, **etching**
 started on both substrate from certain threshold values of the bias
 voltage and the rate increased with increase of the voltage. However, in
C5F8 plasma the increasing tendency on photo-resist was
 much less than on SiO2, while in C4F8 **plasma** the difference is
 small. This difference is attributed to a larger **deposition**
 ability of C4F8 **plasma** with higher content of fluorine atoms in
 the polymer than that of **C5F8 plasma** as confirmed by
 X-ray photoelectron spectroscopy. (C) 2001 Elsevier Science B.V. All
 rights reserved.
 CC MATERIALS SCIENCE, MULTIDISCIPLINARY; PHYSICS, APPLIED; PHYSICS, CONDENSED
 MATTER
 ST Author Keywords: FT-IR absorption spectroscopy; FT-IR ellipsometry;
 polymer **deposition**; chemical bonds; **etching** rate;
 selectivity
 RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
DISCHLER B	1985		45	P 7 INT S PLASM CHEM
DREVILLON B	1998	313	625	THIN SOLID FILMS
HEITZ T	1998	58	957	PHYS REV B
IMAI S	1998		899	T I ELECT INFO COMMU
KROESEN G M W	1998	15	209	J VAS SCI TECHNOL A
LEE H J	1998	37	712	JPN J APPL PHYS
MOTOMURA H	2000	374	243	THIN SOLID FILMS
SCHAEPKENS M	1999	17	26	J VAC SCI TECHNOL A
TACHIBANA E	1996	35	3652	JPN J APPL PHYS 1
VALLON S	1996	10	1287	J ADHES SCI TECHNOL
VALLON S	1997	108	177	APPL SURF SCI
YAMADA Y	1996			3 ANN INT ESH C MONT
YOSHIDA Y	1997			4 ANN INT ESH C MIL

L79 ANSWER 14 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN
 AN 2001:377609 SCISEARCH
 GA The Genuine Article (R) Number: 426NQ
 TI Quantum chemical study on decomposition and polymer **deposition**

in perfluorocarbon **plasmas**: Molecular orbital calculations of excited states of perfluorocarbons

AU Nakamura T (Reprint); Motomura H; Tachibana K

CS Kyoto Univ, Dept Elect Sci & Engn, Sakyo Ku, Kyoto 6068501, Japan (Reprint)

CYA Japan

SO JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES & REVIEW PAPERS, (FEB 2001) Vol. 40, No. 2A, pp. 847-854.

Publisher: INST PURE APPLIED PHYSICS, DAINI TOYOKAIJI BLDG, 4-24-8

SHINBASHI, MINATO-KU TOKYO, 105-004, JAPAN.

ISSN: 0021-4922.

DT Article; Journal

LA English

REC Reference Count: 20

AB Electronic excited states of various perfluorocarbons were investigated using an ab initio molecular orbital calculation. The chemical reactions via the excited states were also predicted from the antibonding characteristics of the molecular orbitals concerned and the first-or der derivative of the potential surface of the excited state. In marked contrast to saturated perfluorocarbons, unsaturated perfluorocarbons can be easily excited to the lowest triplet state with a pi-pi* transition, generating biradicals and subsequently leading to polymerization. in addition to the conventionally used perfluorocarbons, the possibility of two-double-bonded. one-triple-bonded and aromatic perfluorocarbons for application to **plasma** processing was examined on the basis of quantum chemistry. The use of these novel types of fluorocarbon is predicted to be promising for chemical vapor **deposition** (CVD) of low dielectric constant interlayer films and **etching** with high selectivity of SiO2 to Si and Si3N4 because of the excellent potential shown by them to yield a high polymerization and **deposition** rate.

CC PHYSICS, APPLIED

ST Author Keywords: quantum chemistry; perfluorocarbon; ab initio molecular orbital calculation; excited state; fluorocarbon **plasma**; polymer **deposition**; two-double-bonded perfluorocarbon; one-triple-bonded perfluorocarbon; aromatic perfluorocarbon

STP KeyWords Plus (R): FLUORINATED AMORPHOUS-CARBON; CONSTANT INTERLAYER DIELECTRICS; VAPOR-**DEPOSITION**; **C5F8**; SPECTROSCOPY; RADICALS

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
AVILA D V	1994	116	99	J AM CHEM SOC
CUNGE G	1999	85	3952	J APPL PHYS 1
ENDO K	1996	68	2864	APPL PHYS LETT
ENDO K	1995	78	1370	J APPL PHYS
ENDO K	1999	86	2739	J APPL PHYS
FRISCH M J	1995			GAUSSAIN 94 REVISION
IMAI S	1999	38	L888	JPN J APPL PHYS 2
IMAI S				UNPUB
INAYOSHI M	1998	16	233	J VAC SCI TECHNOL A
KAWASAKI T	2000		499	P 17 S PLASM PROC
KOBAYASHI H	1974	8	1345	J MACROMOL SCI CHEM
LEEZENBERG P B	1999	17	275	J VAC SCI TECHNOL A
MASUOKA T	1982	20	2633	J POLYM SCI POL CHEM
MOTOMURA H	2000	374	342	THIN SOLID FILMS
SATO K	1984	45	1324	APPL PHYS LETT

SCHAEPKENS M	1999	17	26	J VAC SCI TECHNOL A
SHIRAFUJI T	1999			IN PRESS MAT RES SOC
SHIRAFUJI T	2000	374	256	THIN SOLID FILMS
TAKAHASHI K	2000	374	303	THIN SOLID FILMS
TAKAHAGI T	1987	20	404	MACROMOLECULES

L79 ANSWER 15 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2000:826441 SCISEARCH

GA The Genuine Article (R) Number: 368MW

TI Radical kinetics for polymer film **deposition** in fluorocarbon (C4F8, C3F6 and **C5F8**) **plasmas**

AU Takahashi K (Reprint); Itoh A; Nakamura T; Tachibana K

CS KYOTO UNIV, DEPT ELECT SCI & ENGN, SAKYO KU, KYOTO 6068501, JAPAN (Reprint)

CYA JAPAN

SO THIN SOLID FILMS, (17 OCT 2000) Vol. 374, No. 2, pp. 303-310.

Publisher: ELSEVIER SCIENCE SA, PO BOX 564, 1001 LAUSANNE, SWITZERLAND.

ISSN: 0040-6090.

DT Article; Journal

FS PHYS; ENGI

LA English

REC Reference Count: 19

AB Film **deposition** mechanisms were investigated in capacitively-coupled **plasmas** of fluorocarbon (C4F8, C3F6 and **C5F8**) gases. In a **C5F8 plasma**, slightly fluorine-rich film was obtained and the **deposition** rate was twice as large as those in C4F8 and C3F6 **plasmas**. In order to understand such a different behavior in the film **deposition**, densities of the gas-phase species were measured by infrared laser absorption spectroscopy (IRLAS). Densities of smaller mass radicals such as CF, CF₂, and CF₃ were on the order of 10(10), 10(12) and 10(11) cm⁻³, respectively, in every source gas but had no direct correlation with the **deposition** tendency. Stable molecules such as CF₄ and C₂F₆ were also produced in every gas, but the quantities were smallest in a **C5F8 plasma**. This indicates that polymerization reactions in the gas phase and on the surface were suppressed in producing the stable species in C4F8 and C3F6 **plasmas**. The presence of high-mass and less-stable species in the gas phase in a **C5F8 plasma** was suggested to be responsible for the **deposition** of polymers with a higher rate and larger fluorine content. (C) 2000 Elsevier Science S.A. All rights reserved.

CC PHYSICS, APPLIED; MATERIALS SCIENCE; PHYSICS, CONDENSED MATTER

ST Author Keywords: fluorocarbon film; **plasma** polymerization; low GWP alternative gas; **C5F8**; C4F8; C3F6; radical measurementSTP KeyWords Plus (R): DIODE-LASER SPECTROSCOPY; CF₂ RADICALS; BAND

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
BREITBARTH F W	1997	17	39	PLASMA CHEM PLASMA P
CUNGE G	1999	85	3952	J APPL PHYS
DAVIES P B	1981	75	5602	J CHEM PHYS
ENDO K	1999	86	2739	J APPL PHYS
GOTO T	1996	68	1059	PURE APPL CHEM
HAVERLAG M	1994	12	3102	J VAC SCI TECHNOL A
IMAI S	1999	38	L888	JPN J APPL PHYS PT 2
INAYOSHI M	1998	16	233	J VAC SCI TECHNOL A
ITO Y	1998		263	P DRY PROC S TOKY

KAWAGUCHI K	1981	86	136	J MOL SPECTROSC
MILLS I M	1958	28	851	J CHEM PHYS
NAKAMURA T	2000		315	P 17 S PLASM PROC NA
OEHRLEIN G S	1994	12	323	J VAC SCI TECHNOL A
SCHAEPKENS M	1999	17	26	J VAC SCI TECHNOL A
SHIRAFUJI T	1999	68	532	OYO BUTURI
STOFFELS E	1999	75	777	J PLASMA FUSION RES
STOFFELS W W	1998	16	87	J VAC SCI TECHNOL A
SUZUKI C	1998	16	2222	J VAC SCI TECHNOL A
YAMADA C	1983	78	1703	J CHEM PHYS

L79 ANSWER 16 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2000:826432 SCISEARCH

GA The Genuine Article (R) Number: 368MW

TI **Plasma** enhanced chemical vapor **deposition** of thermally stable and low-dielectric-constant fluorinated amorphous carbon films using low-global-warming-potential gas **C5F8**

AU Shirafuji T (Reprint); Kamisawa A; Shimasaki T; Hayashi Y; Nishino S
CS KYOTO INST TECHNOL, DEPT ELECT & INFORMAT SCI, SAKYO KU, KYOTO 6068585, JAPAN (Reprint); ROHM CO LTD, SEMICOND PROC RES & DEV DIV, UKYO KU, KYOTO 6158585, JAPAN

CYA JAPAN

SO THIN SOLID FILMS, (17 OCT 2000) Vol. 374, No. 2, pp. 256-261.
Publisher: ELSEVIER SCIENCE SA, PO BOX 564, 1001 LAUSANNE, SWITZERLAND.
ISSN: 0040-6090.

DT Article; Journal

FS PHYS; ENGI

LA English

REC Reference Count: 12

AB Low-dielectric-constant fluorinated amorphous carbon films have been prepared from the low global-warming-potential gas of **C5F8** by a capacitively coupled **plasma** enhanced chemical vapor **deposition** method. Films were prepared at substrate temperatures as high as 400 degreesC. The obtained **deposition** rate of 15-65 nm/min was higher than that of conventional C4F8 **plasma** at the same substrate temperature. The dielectric constant of the films varied from 2.1 to 2.5 with increasing RF power from 10 to 100 W. The residual thickness of the films after 400 degreesC-thermal treatment was higher than 98%. At an RF power higher than 50 W, cracks appeared in the films that were rapidly cooled from 400 degreesC to room temperature, and poor adhesion characteristics were obtained even for the samples without cracks after gradual cooling. On the other hand, the samples prepared at 10 W showed no cracks and good adhesion on a crystalline silicon substrate regardless of the cooling rate. (C) 2000 Elsevier Science S.A. All rights reserved.

CC PHYSICS, APPLIED; MATERIALS SCIENCE; PHYSICS, CONDENSED MATTER

ST Author Keywords: **C5F8**; global warming potential; **plasma**; chemical vapor **deposition**; low dielectric constant; inter-metal dielectric

STP KeyWords Plus (R): FLUOROCARBON FILMS; THIN-FILMS

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
DAGOSTINO R	1990		95	PLASMA DEPOSITION TR
ENDO K	1995	78	1370	J APPL PHYS
HENDRICKS N H	1997	443	3	MATER RES SOC S P
ITO Y	1998		263	P 20 S DRY PROC I EL

LABELLE C B	1997	443	189	MATER RES SOC S P
LANG C I	1995	381	45	MATER RES SOC SYMP P
LEE W W	1997	22	19	MRS BULL
MOUNTSIER T W	1997	443	41	MATER RES SOC S P
SHIRAFUJI T	1999	38	4520	JPN J APPL PHYS PT 1
SHIRAFUJI T	2000		425	MAT RES SOC S P ADV
SHIRAFUJI T	1999	4	57	PLASMAS POLYM
TAKEISHI S	1997	144	1797	J ELECTROCHEM SOC

L79 ANSWER 17 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 2000:826430 SCISEARCH

GA The Genuine Article (R) Number: 368MW

TI Difference between C4F8 and **C5F8 plasmas** in surface reaction processes for selective **etching** of SiO2 over Si3N4

AU Motomura H; Imai S; Tachibana K (Reprint)

CS KYOTO UNIV, DEPT ELECT SCI & ENGN, SAKYO KU, KYOTO 6068501, JAPAN (Reprint); KYOTO UNIV, DEPT ELECT SCI & ENGN, SAKYO KU, KYOTO 6068501, JAPAN; MATSUSHITA ELECT CORP, ULSI PROC TECHNOL DEV CTR, MINAMI KU, KYOTO 6018413, JAPAN

CYA JAPAN

SO THIN SOLID FILMS, (17 OCT 2000) Vol. 374, No. 2, pp. 243-248.

Publisher: ELSEVIER SCIENCE SA, PO BOX 564, 1001 LAUSANNE, SWITZERLAND.

ISSN: 0040-6090.

DT Article; Journal

FS PHYS; ENGI

LA English

REC Reference Count: 12

AB Surface reactions induced by fluorocarbon **plasmas** were studied on SiO2 and Si3N4 substrates using an inductively coupled **plasma** source. C4F8 and **C5F8** were employed as source gases to investigate their differences in **etching** performance and selectivity on both SiO2 and Si3N4 substrates. Polymer **deposition** was noticed in both gases by Fourier transform infrared ellipsometric measurements when substrate bias was not applied. When the bias was applied, **etching** started on the SiO2 surface from a certain threshold bias voltage and the rate increased with the increase in voltage. However, on the Si3N4 surface this increasing tendency in **C5F8 plasma** was much less than that in C4F8

plasma. This difference provides a greater selectivity of SiO2 to Si3N4 in **C5F8 plasma**. The reason for this increased

deposition tendency in **C5F8 plasma** is attributed to the presence of higher mass species in a larger abundance than in C4F8 **plasma**, as confirmed by electron attachment mass spectrometry. (C) 2000 Elsevier Science S.A. All rights reserved.

CC PHYSICS, APPLIED; MATERIALS SCIENCE; PHYSICS, CONDENSED MATTER

ST Author Keywords: FT-IR ellipsometry; polymer **deposition**; **etching** rate; selectivity; electron attachment mass spectrometry; polymerized species

STP KeyWords Plus (R): ATTACHMENT MASS-SPECTROSCOPY; POLYMERIZATION; DIAGNOSTICS

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
CUNGE G	1999	85	3952	J APPL PHYS
IMAI S	1999	38	L888	JPN J APPL PHYS PT 2
IMAI S	1998		899	T I ELECT INFO COMMU
KARECHI S	1997		1	SEMICON SW 97

KROESEN G M W	1998 15	209	J VAS SCI TECHNOL A
LEE H J	1998 37	712	JPN J APPL PHYS
SCHAEPKENS M	1999 17	26	J VAC SCI TECHNOL A
STOFFELS E	1998 69	116	REV SCI INSTRUM
STOFFELS W W	1998 16	87	J VAC SCI TECHNOL A
TACHIBANA E	1996 35	3652	JPN J APPL PHYS PT 1
YAMADA Y	1996		3 ANN INT ESH C MONT
YOSHIDA Y	1997		4 ANN INT ESH C MIL

L79 ANSWER 18 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN

AN 1999:754552 SCISEARCH

GA The Genuine Article (R) Number: 241EK

TI Analysis of product species in capacitively coupled **C5F8**

plasma by electron attachment mass spectroscopy

AU Imai S (Reprint); Tachibana K

CS MATSUSHITA ELECT CORP, ULSI PROC TECHNOL DEV CTR, MINAMI KU, 19 NISHIKUJO KASUGACHO, KYOTO 6018413, JAPAN (Reprint); KYOTO UNIV, DEPT ELECT SCI & ENGN, SAKYO KU, KYOTO 6068501, JAPAN

CYA JAPAN

SO JAPANESE JOURNAL OF APPLIED PHYSICS PART 2-LETTERS, (1 AUG 1999) Vol. 38, No. 8A, pp. L888-L891.

Publisher: JAPAN J APPLIED PHYSICS, DAINI TOYOKAIJI BLDG 24-8 SHINBASHI 4-CHOME, MINATO-KU TOKYO 105, JAPAN.

ISSN: 0021-4922.

DT Article; Journal

FS PHYS

LA English

REC Reference Count: 9

AB The decomposition and reaction products of **C5F8** gas in a capacitively coupled **plasma** have been investigated by electron attachment mass spectroscopy (EAMS). Although only a few species are produced directly from **C5F8** molecules by dissociative electron attachment, a variety of species appears after the discharge is ignited. The products comprise not only fragmented species but also polymerized species with larger masses than that of the parent molecule. It has been clarified from the energy spectra of the F- signal that perfluoro-compounds such as CF₄, C₂F₆ and C₃F₈ are produced through the decomposition of **C5F8**, followed by secondary reactions in the gas phase. A tendency towards polymerization with increments of CF₂ units is also noted.

CC PHYSICS, APPLIED

ST Author Keywords: **C5F8**; decomposition; polymerization; electron attachment mass spectroscopy; perfluoro-compounds; global warming potential

RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
GOTO Y	1997		261	P 19 DRY PROC S TOK
IMAI S	1998		899	T ELECT INFO COMMUN
KAREKEZI S	1997		1	AFR ENER POL RES SER
SPYROU S M	1983 78		7200	J CHEM PHYS
STOFFELS E	1998 69		116	REV SCI INSTRUM
STOFFELS W W	1998 16		87	J VAC SCI TECHNOL A
SUGAI H	1992 10		1193	J VAC SCI TECHNOL A
YAMADA Y	1996			3 ANN INT ESH C MONT
YOSHIDA Y	1997			4 ANN INT ESH C MIL

L79 ANSWER 19 OF 21 SCISEARCH COPYRIGHT 2004 THOMSON ISI on STN
 AN 1999:718451 SCISEARCH
 GA The Genuine Article (R) Number: 236JN
 TI Differences in radical generation due to chemical bonding of gas molecules in a high-density fluorocarbon **plasma**: Effects of the C=C bond in fluorocarbon gases
 AU Samukawa S (Reprint); Mukai T
 CS NEC CORP LTD, SILICON SYST RES LABS, LSI BASIC RES LAB, 34 MIYUKIGAOKA, IBARAKI, OSAKA 3058501, JAPAN (Reprint)
 CYA JAPAN
 SO JOURNAL OF VACUUM SCIENCE & TECHNOLOGY A-VACUUM SURFACES AND FILMS, (SEP-OCT 1999) Vol. 17, No. 5, pp. 2463-2466.
 Publisher: AMER INST PHYSICS, CIRCULATION FULFILLMENT DIV, 500 SUNNYSIDE BLVD, WOODBURY, NY 11797-2999.
 ISSN: 0734-2101.
 DT Article; Journal
 FS PHYS; ENGI
 LA English
 REC Reference Count: 11
 AB We investigated the differences in radical generation due to chemical bonding of fluorocarbon gas molecules in the **plasma**. We found that dissociation of the C=C bond is five times easier than that of the C-C bond in a fluorocarbon: gas **plasma**. As a result, a C2F4 **plasma** could generate a higher density of CF2 radicals than a C4F8 **plasma**. Additionally, the same dissociation processes occurred in the C3F6 and **C5F8 plasma**, which both have the C=C bond and C-C bond in their molecules. In the C3F6 **plasma**, the density of generated CF2 radicals was 3.5 times higher than that for CF or CF3 radicals, whose radical densities were the same. The **C5F8 gas plasma** mainly produced CF2 and CF radicals, and the CF radical density was higher in comparison to other fluorocarbon gas **plasmas**.
 . (C) 1999 American Vacuum Society. [S0734-2101(99)08305-0].
 CC PHYSICS, APPLIED; MATERIALS SCIENCE, COATINGS & FILMS
 STP KeyWords Plus (R): FREQUENCY
 RE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)
HIKOSAKA Y	1993	32	353	JPN J APPL PHYS
HIKOSAKA Y	1997	36	1877	JPN J APPL PHYS PT 2
KAZUMI H	1995	34	2125	JPN J APPL PHYS PT 1
MALYSHEV M V	1998	84	1222	J APPL PHYS
MIYATA K	1997		63	P 3 C REACT PLASM JA
SAKAI T	1993		93	P 15 DRY PROC S I EL
SAMUKAWA S	1995	34	6805	JPN J APPL PHYS PT 1
SAMUKAWA S	1997	35	7647	JPN J APPL PHYS PT 1
SUZUKI C	1997		437	P 3 C REACT PLASM JA
TACHI S	1982	21	141	JPN J APPL PHYS PT 1
TATSUMI T	1998	37	2394	JPN J APPL PHYS PT 1

L79 ANSWER 20 OF 21 NTIS COPYRIGHT 2004 NTIS on STN
 AN 1978(40):06775 NTIS Order Number: CONF-780301-1/XAB
 TI Dielectric Strengths of New **Gases** and **Gas Mixtures**.
 AU James, D. R.; Christophorou, L. G.; Pai, R. Y.; Pace, M. O.; Mathis, R. A.
 CS Oak Ridge National Lab., Tenn.
 Sponsor: Tennessee Univ., Knoxville.

NR Sponsor: Department of Energy. (4832000)
CONF-780301-1/XAB
28p; 1978

NC Contract(s): W-7405-ENG-26
DT Report
CY United States
LA English
NTE International conference on gaseous dielectrics, Knoxville, TN, USA, 6 Mar 1978.

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OS GRA&I7819; ERA0300
AB It is emphasized that the most effective gaseous dielectrics are **gas mixtures** with components chosen on the basis of fundamental physicochemical knowledge, especially on low-energy electron-molecule interactions. On the basis of such knowledge, especially on electron attachment and electron slowing down, a number of new **gases** and **gas mixtures** have been found with breakdown strengths superior to pure SF sub 6 . These include the unitary gases c-C sub 4 F sub 8 (perfluorocyclobutane), C sub 4 F sub 8 (perfluorobutene-2), C sub 4 F sub 6 (perfluoro-2-butyne), C sub 6 F sub 10 (perfluorocyclohexene), C sub 5 F sub 8 (**perfluorocyclopentene**), and C sub 6 F sub 12 (perfluorodimethylcyclobutane), and the multicomponent **gas mixtures** 20% C sub 4 F sub 6 + 80% SF sub 6 , 40% C sub 4 F sub 6 + 60% N sub 2 , 50% C sub 4 F sub 6 + 50% SF sub 6 , and 30% C sub 4 F sub 6 + 20% SF sub 6 + 50% N sub 2 with DC breakdown strengths relative to SF sub 6 of 1 equal to 1.4, 1.8, 2.2, 2.1, 2.2, 2.4, 1.3, 1.4, 1.75, and 1.33, respectively. Findings on these and other systems are presented and discussed. Also discussed are results on the dielectric strengths of some of the above new gases measured with cylindrical electrode geometries using different center conductor diameters. Finally, findings on the initial decomposition products of some of the new insulators caused by electron impact are presented and their implications assessed. (ERA citation 03:034953)

CC 97E Electric power transmission
49G Resistive, capacitive, and inductive components

CT *Carbon fluorides; *Gas-insulated cables; *Sulfur fluorides; Binary mixtures; Breakdown; Dielectric properties; EHV ac systems; Electrical insulation; Gases; Hydrogen; Mixtures; Nitrogen; Performance testing; Power transmission lines; Toxicity
*DIELECTRICS; CYCLOBUTANE/FLUORO; BUTENE/FLUORO; BUTYNE/FLUORO; CYCLOHEXENE/FLUORO; CYCLOPENTENE/FLUORO; CYCLOBUTANE/FLUORO-METHYL

UT ERDA/200301

L79 ANSWER 21 OF 21 NTIS COPYRIGHT 2004 NTIS on STN
AN 1978(38):06372 NTIS Order Number: ORNL/TM-6113/XAB
TI High Voltage Research (Breakdown Strengths of Gaseous and Liquid Insulators). Semiannual Report, April 1--September 30, 1977.
AU Christophorou, L. G.; James, D. R.; Pai, R. Y.; Mathis, R. A.; Pace, M. O.
CS Oak Ridge National Lab., Tenn.
Sponsor: Department of Energy. (4832000)
NR ORNL/TM-6113/XAB
124p; Nov 1977

NC Contract(s): W-7405-ENG-26
DT Report
CY United States
LA English
AV Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC A06/MF A01
OS GRA&I7812; ERA0300
AB Direct current breakdown strength measurements on a large number of multicomponent **gas mixtures** at low (approximately less than 1 atm) and high (approximately less than 5 atm) pressures led to the discovery of many **gas mixtures** of electron-attaching gases and strongly electron-attaching gases with N sub 2 and C sub 3 F sub 8 which are superior to SF sub 6 . Of special significance are mixtures containing C sub 4 F sub 6 (perfluoro-2-butyne). The breakdown strength of one such mixture (20 percent C sub 4 F sub 6 to 80 percent SF sub 6) is approximately 30 percent higher than pure SF sub 6 under identical conditions, both at low (approximately 0.7 atm) and high (4.6 atm) pressures. Perfluorocyclohexene (C sub 6 F sub 10) and C sub 5 F sub 8 (**perfluorocyclopentene**) were found at low pressure (approximately 0.2 atm) to be, respectively, approximately 2.1 and 2.2 times better than SF sub 6 under comparable conditions; they both have a potential as additives in **gas mixtures**. The effect of the inelastic electron scattering properties of a gas via negative ion resonances in the low-energy range (1 to approximately 4 eV) on the breakdown strength has been demonstrated for H sub 2 , N sub 2 , and CO and binary mixtures of these with SF sub 6 and C sub 4 F sub 6 (perfluoro-2-butyne). The construction of a new high pressure (to approximately 11 atm), variable temperature (-50 exp 0 C to + 150 exp 0 C) apparatus has been completed and a practical test facility utilizing cylindrical electrode geometries has been put into operation; the first results on the latter apparatus were on SF sub 6 -N sub 2 and c-C sub 4 F sub 8 --N sub 2 mixtures. Studies of environmental effects of dielectric gases via their electron-impact-induced decompositions and analysis of their breakdown products have begun using mass spectrometry and gas chromatography; C sub 4 F sub 6 (perfluoro-2-butyne) seems to be resistant to electron-impact-induced decomposition indicating long-term stability. (ERA citation 03:014568)
CC 49F Power and signal transmission devices
97E Electric power transmission
CT *Carbon fluorides; *Carbon monoxide; *Gas-insulated cables; *Hydrogen; *Nitrogen; Breakdown; Dielectric properties; Mixtures; Power systems; Research programs; Sulfur fluorides
DIELECTRIC BREAKDOWN; ELECTRICAL INSULATION
UT ERDA/200300

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SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
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1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

SUBSTANCE: OCTAFLUOROCYCLOPENTENE

TRADE NAMES/SYNONYMS:

1,2,3,3,4,4,5,5-OCTAFLUORO-1-CYCLOPENTENE;
1,2,3,3,4,4,5,5-OCTAFLUOROCYCLOPENTENE; CYCLOPENTENE, OCTAFLUORO-;
PERFLUOROCYCLOPENTENE; FC-C1418; FLON C 1418; FRON C 1418; ZEORORA-L; C5F8;
00201204; RTECS GY6000000

CHEMICAL FAMILY: organic, fluoride

CREATION DATE: Jul 16 1998

REVISION DATE: Mar 19 2003

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: OCTAFLUOROCYCLOPENTENE
CAS NUMBER: 559-40-0
EC NUMBER (EINECS): 209-203-0
PERCENTAGE: 100.0

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=1

EMERGENCY OVERVIEW:

COLOR: colorless

PHYSICAL FORM: liquid

ODOR: distinct odor

MAJOR HEALTH HAZARDS: harmful if inhaled

PHYSICAL HAZARDS: May decompose when heated. May release toxic and/or flammable gases.

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation, nausea, difficulty breathing, headache, dizziness

LONG TERM EXPOSURE: headache, drowsiness, dizziness

SKIN CONTACT:

SHORT TERM EXPOSURE: same as effects reported in long term exposure, irritation, absorption may occur

LONG TERM EXPOSURE: headache, drowsiness, dizziness

EYE CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: no information is available

INGESTION:

SHORT TERM EXPOSURE: no information is available

LONG TERM EXPOSURE: no information is available

CARCINOGEN STATUS:

OSHA: No

NTP: No

IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If a large amount is swallowed, get medical attention.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard. Containers may rupture or explode if exposed to heat.

EXTINGUISHING MEDIA: regular dry chemical, regular foam, water

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk.

Fight large fires from a protected location or safe distance. Stay away from the ends of tanks. Dike for later disposal. Do not scatter spilled material with high-pressure water streams. Do not attempt to extinguish fire unless

flow of material can be stopped first. Use extinguishing agents appropriate for surrounding fire. Flood with fine water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Consider downwind evacuation if material is leaking.

FLASH POINT: not flammable

SECTION 6 ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:

Do not touch spilled material. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Small dry spills: Move containers away from spill to a safe area. Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering.

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Store in a tightly closed container. Store in a cool, dry place. Store in a well-ventilated area. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

OCTAFLUOROCYCLOPENTENE:

No occupational exposure limits established.

VENTILATION: Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

PROTECTIVE MATERIAL TYPES: neoprene, rubber

RESPIRATOR: Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use.

Any chemical cartridge respirator with organic vapor cartridge(s).

Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

Any air-purifying respirator with a full facepiece and an organic vapor

canister.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

COLOR: colorless

ODOR: distinct odor

MOLECULAR WEIGHT: 212.05

MOLECULAR FORMULA: C5-F8

BOILING POINT: 81 F (27 C)

FREEZING POINT: <-94 F (<-70 C)

VAPOR PRESSURE: 614 mmHg @ 21 C

VAPOR DENSITY (air=1): >1

SPECIFIC GRAVITY (water=1): 1.58

WATER SOLUBILITY: slightly soluble

PH: Not available

VOLATILITY: 100 % by weight

ODOR THRESHOLD: Not available

EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: acetone

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: May decompose on contact with heat and/or storage and use above room temperature. Releases toxic gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: metals, oxidizing materials

OCTAFLUOROCYCLOPENTENE:

ALKALI EARTH METALS: Incompatible.

ALKALINE EARTH METALS: Incompatible.

ALUMINUM (POWDERED): Incompatible.

BERYLLIUM (POWDERED): Incompatible.

OXIDIZERS (STRONG): Fire and explosion hazard.

ZINC (POWDERED): Incompatible.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: halogenated compounds, hydrogen fluoride, oxides of carbon

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

OCTAFLUOROCYCLOPENTENE:

TOXICITY DATA:

1124 ppm/1 hour(s) inhalation-rat LC50 (Zeon Chemicals, Inc.); 30000 ppm
inhalation-mouse LCLo

ACUTE TOXICITY LEVEL:

Toxic: inhalation

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

OCTAFLUOROCYCLOPENTENE: Vapor or mist may cause irritation of the respiratory tract, nose, and throat, nausea, dizziness, headaches, shortness of breath, lethargy, and unconsciousness. At high concentrations narcosis and cardiac arrhythmias may occur.

CHRONIC EXPOSURE:

OCTAFLUOROCYCLOPENTENE: Repeated or prolonged exposure to vapor or mist may cause headache, dizziness and drowsiness. In a study on rats, exposure to 7.5 ppm or more for 13 weeks produced an increase in lung and liver weights. Accompanied by microscopic lung lesions, an increase of lung and kidney weights occurred when rats were exposed to 50 ppm for 14 days. When exposure was withdrawn, effects regressed completely in 4 weeks. The no-observed adverse effect level (NOAEL) was determined to be 2 ppm. When tested on pregnant rats for 6 hours a day between day 6 and 19, maternal toxicity was reported at 100 ppm and a marginal effect on lung and body weight were reported at 10 and 30 ppm. A slight reduction was reported in the mean fetal weight at 100 ppm and was accompanied by a slight increase in major cardiovascular malformations. The no-observed adverse effect level (NOAEL) was determined to be 30 ppm.

SKIN CONTACT:

ACUTE EXPOSURE:

OCTAFLUOROCYCLOPENTENE: Vapor or mist may cause irritation. Skin absorption may occur.

CHRONIC EXPOSURE:

OCTAFLUOROCYCLOPENTENE: Repeated or prolonged exposure to vapors may cause headache, dizziness and drowsiness.

EYE CONTACT:

ACUTE EXPOSURE:

OCTAFLUOROCYCLOPENTENE: Vapor or mist may cause irritation. Studies on rabbit eyes produced reversible irritation of the conjunctiva, slight corneal opacification in 2/6 rabbits, inflammation of the iris in 1/6 rabbits. Except for mild conjunctival redness in 1/6 rabbits, effects were reversed in 21 days.

CHRONIC EXPOSURE:

OCTAFLUOROCYCLOPENTENE: No data available.

INGESTION:

ACUTE EXPOSURE:

OCTAFLUOROCYCLOPENTENE: No data available.

CHRONIC EXPOSURE:

OCTAFLUOROCYCLOPENTENE: No data available.

SECTION 12 ECOLOGICAL INFORMATION

Not available

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Toxic liquids, organic, n.o.s.
(OCTAFLUOROCYCLOPENTENE)

ID NUMBER: UN2810

HAZARD CLASS OR DIVISION: 6.1

PACKING GROUP: II

LABELING REQUIREMENTS: 6.1

CANADIAN TRANSPORTATION OF DANGEROUS GOODS: No classification assigned.

LAND TRANSPORT ADR: No classification assigned.

LAND TRANSPORT RID: No classification assigned.

AIR TRANSPORT IATA: No classification assigned.

AIR TRANSPORT ICAO: No classification assigned.

MARITIME TRANSPORT IMDG: No classification assigned.

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes

CHRONIC: No
FIRE: No
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65): Not regulated.

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:

California Proposition 65: Not regulated.

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:

EC CLASSIFICATION (CALCULATED): Not determined.

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Not listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

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